User's Guide to the

Building Design Advisor

Building Design Advisors 1.0

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BDA Overview

Introduction

The Building Design Advisor (BDA) software is the result of research and development efforts by the Building Technologies Department of the Environmental Energy Technologies Division at Ernest Orlando Lawrence Berkeley National Laboratory.

The BDA is a software environment that supports the integrated use of multiple simulation tools and databases, through a single, graphical user interface that allows comparison of multiple alternative solutions with respect to multiple performance parameter. The BDA uses an object-oriented model of the building and its context, along with extendible libraries of building components and systems. Using a combination of a CAD-like Schematic Graphic Editor and a Default Value Selector mechanism, the BDA automates the preparation of the required input to simulation tools from the early, schematic phases of building design, and presents their results in the customizable graphical output.

Objective

The objective of the Building Design Advisor development efforts is to provide means for quick and easy consideration of energy-efficient and environmentally sustainable strategies and technologies from the initial, schematic phases of building design.

Scope of BDA 1.0

The scope of BDA 1.0 covers the data needs of a CAD-like Schematic Graphic Editor and two simulation tools: RESEGY and DElight. RESEGY is a general energy use computational module that calculates monthly energy requirements by end use and energy source. DElight is a daylight analysis module that computes daylight illuminance, glare values as new savings due to daylighting at the individual space level. The object-oriented building model of this version of the BDA supports the functionality of these two simulation tools.

In BDA 1.0, your project can be an Office Building, a Restaurant or a Hotel/Motel, and it must consist of only one building. That building can have an unlimited number of floors with an unlimited number of spaces in each floor. Each space can be assigned to a single user-defined thermal zone. Spaces such as elevators, stairways and atria can span more than one floor. While the BDA supports any

polygonal shapes, the current version of DElight (the daylighting tool) can only be used for rectilinear spaces.

Each space has boundaries (Walls, Ceiling and Floor) that are automatically generated when you draw the space in SGE. When spaces are drawn adjacent to each other, automatic boundary segmentation occurs and the affected Walls are divided into External and Internal Wall Segments. Although an Aperture can be placed in any Wall Segment, DElight only models Windows in External Wall Segments.

The BDA Core Program

The BDA core program is the data and process manager that creates and saves projects, and solutions. It supports the integrated use of multiple simulation tools and databases, acting as a data manager and process controller. The program also launches the Schematic Graphic Editor (SGE), and whatever Simulation Tools are needed to calculate the performance parameter values requested by the user. The BDA core program has the following main components:

- a Components Libraries Database access module,
- a Projects Database access module,
- a Default Value Selector module,
- two main GUI modules,
  - the **Building Browser** and
  - the **Design Decision Desktop**,
- two minor GUI elements,
  - the **Object Information Dialog** and
  - the **Parameter Information Dialog**,
- An OLE interfaces to the SGE application and
- An interface module for each one of the Simulation Tools.

GUI (Graphical User Interface) allows users to graphically input commands and see outputs on the screen.

Object Oriented Representation

BDA Schema

To facilitate the extendibility of the BDA building model, we have based its representation on a generic Data Schema, which consists primarily of Design Objects, Parameters, Relationships, Values, Units, and Simulation Tools.

Design Objects (e.g. Building, Story, Space, Boundary, Boundary Segment, Aperture, etc.) represent building components and systems as “containers” for parameters and are linked to each other through Relationships.

Parameters (e.g. total_energy_use, floor_to_floor_height, hot_water_use, surface_area, etc.) represent the state of the Design Objects with respect to the basic data needs and outputs of the Simulation Tools.

Relationships (e.g. composed_of, part_of, contains, contained_in, etc.) represent links between the Design Object instances and provide a navigational framework for accessing those instances.

Values can be one of six different data types:

- integer,
- real number,
- text string,
- array of real numbers,
- bitmap or image, and
- Video or audio.

Units (e.g., ft, KBTUs, fc, etc.) qualify the values of parameters.

Simulation Tools (e.g. DElight, RESEGY) use the values of certain parameters as inputs and produce the values for other parameters as outputs. RESERGY for example takes in the building designed by the user and calculate different energy uses.

The **BDA Building Model** is the union of the Design Objects needed by SGE and the Simulation Tools integrated in the current version. The Building Model is actually a semantic network specifying how individual Design Object instances relate to each other both topologically and functionally. Each Simulation Tool reasons about or is concerned with a "view" or "subset" of the whole, unified Building Model.

This generic view of Design Objects and parameters allows us to easily integrate a new Simulation Tool by specifying the Design Objects that the tool reasons about, the parameters that it needs as input and those that it produces as output.

Design Object Prototypes

The Component Libraries Database (CLD) contains prototypical instances or "prototypes" of some of the Design Object Types whose parameters have values obtained from sources such as ASHRAE, BOCA, CEC, IESNA, etc., representing codes, standards and recommended practice. The Default Value Selector module of the BDA core program uses prototypes to populate each newly created Design Object instance with default values. When you change the prototype of a Design Object instance using the Object Information Dialog, the BDA core program queries the CLD for the existing prototypes of that Design Object Type and lists them in the Prototype Selection Dialog.

Links to Applications

The current version of the BDA is linked to three main applications, which are described below:

The Schematic Graphic Editor (SGE)

Although it appears as an integral part of BDA's graphical user interface, the Schematic Graphic Editor (SGE) is actually a separate Windows® application, which is launched by the BDA core program when a new project is created or an existing project is loaded. The SGE remains active during the entire design session

and communicates with the BDA through two OLE interfaces. The SGE-to-BDA interface is used to notify the BDA core program about the creation and modification of certain design objects, such as Stories, Spaces, Apertures, etc., and also to pass the necessary data resulting from those changes. The BDA-to-SGE interface is used to notify SGE of events that are initiated by the user in the BDA core program and that SGE needs to know about. These include, Project Saves and Loads, BDA Exit, user requests from BDA's Building Browser for the highlighting of objects in SGE, etc. As a separate application, SGE has its own on-line help and documentation.

The Simplified Daylighting Analysis Module (DElight)

The Simplified Daylighting Analysis Module computes Daylight Work-plane Illuminance and Glare Index levels at any point in time and space within a rectangular room. The output of DElight is specified as the following list of performance parameters for rectangular space objects

- **Spatial Work Plane Illuminance** is computed by default on a 4-ft grid at a height of 3.0 ft from the floor, at 2:00 PM, on June 21. It is calculated for a single sun position and sky condition over a variable grid within a space(an interior point in space but across time). It takes light which originates from the sky, and reaches the window directly or by reflection from exterior surfaces. And the light which originates from the sun. Light from the window then reaches the workplane directly or via reflection from the interior surfaces of the room. The spatial work plane illuminance calculates illuminance
- **Temporal Work Plane Illuminance** is computed by default at 3.0 ft from the floor at the center of the room. It is calculated for a single location in a space by the hour, one day per month. This work plane illuminance is calculated at a fixed position throughout time.
- **Spatial Glare Index** is computed by default on a 4-ft grid, for a North-facing occupant, at 2:00 PM, on June 21. The spatial glare index calculates the Glare Index at different position points. Glare index is the net daylight glare a reference point due to all of the windows in a room.
- **Temporal Glare Index** is computed by default for a North-facing occupant, at 3.0 ft from the floor, at the center of the room. It is similar to the Spatial Glare Index except it calculates the glare index at a single position throughout time.
- **Monthly Electric Lighting Savings** (percent saved for each hour of a typical day in each month of the year) is computed for a default lighting power density that is set by the Default Value Selector and assuming continuous dimming controls.
- **Annual Electric Lighting Savings** (percent saved for each hour of an average day for the year) is computed for a default lighting power density that is set by the Default Value Selector and assuming continuous dimming controls.

The default values for the context of the calculations for all of the above parameters can be changed through the Space parameters in the Building Browser. When the user selects any of the above parameters for display in the Decision Desktop, the BDA automatically prepares the required input, activates the DElight and then receives the results and displays them in the Decision Desktop.

The Simplified Energy Analysis Module (RESEGY)

The Simplified Energy Analysis Module (RESEGY) computes monthly energy requirements by source (e.g., gas, electricity, etc.) and end use (e.g., lighting, cooling, etc.). The output of RESEGY is specified as the following list of performance parameters for the Building object:

- **Total Energy Use** is the total energy required for the whole building and for an entire typical year, which includes all energy sources (e.g., gas, electricity, etc.) and all end uses (e.g., lighting, cooling, etc.).
- **Total Energy by Fuel Type** is the total energy use broken down by fuel type (e.g., gas, electricity, etc.) for the whole building and for an entire typical year, including all end uses (e.g., lighting, cooling, etc.).
- **Total Energy by End Use** is the total energy use broken down by end use (e.g., lighting, cooling, etc.) for the whole building and for an entire typical year, including all energy sources (e.g., gas, electricity, etc.)..
- **Monthly Energy by Fuel Type** is the total energy use for each month, broken down by fuel type (e.g., gas, electricity, etc.) for the whole building and for an entire typical year, including all end uses (e.g., lighting, cooling, etc.)..
- **Monthly Energy by End Use** is the total energy use for each month, broken down by end use (e.g., lighting, cooling, etc.) for the whole building and for an entire typical year, including all energy sources (e.g., gas, electricity, etc.).

When the user selects any of the above parameters for display in the Decision Desktop, the BDA automatically prepares the required input, activates the RESEGY and then receives the results and displays them in the Decision Desktop. The RESEGY is also used to automatically calculate the size of the HVAC equipment, which can also be specified by the user.

Default values

To allow use of simulation tools from the early, schematic phases of building design, the BDA assigns default values to all parameters that are required as input to the simulation tools linked to it. The Prototypical Value Selector (PVS) module from the Component Libraries Database (CLD) selects the default values.

The Default Value Selector (DVS)

The Default Value Selector (DVS) is one of the major modules of the BDA core program. Each time a new object is created in the Schematic Graphic Editor (SGE), the BDA activates the DVS, which selects a prototype from the Components Libraries Database (CLD), based on Building Location, Building Type and Space Type. The DVS saves you from having to specify dozens of default values for all the Design Object instances created as a result of specifying the geometry of a new object in SGE. You may change these default values at any time through the Building Browser.

BDA Project

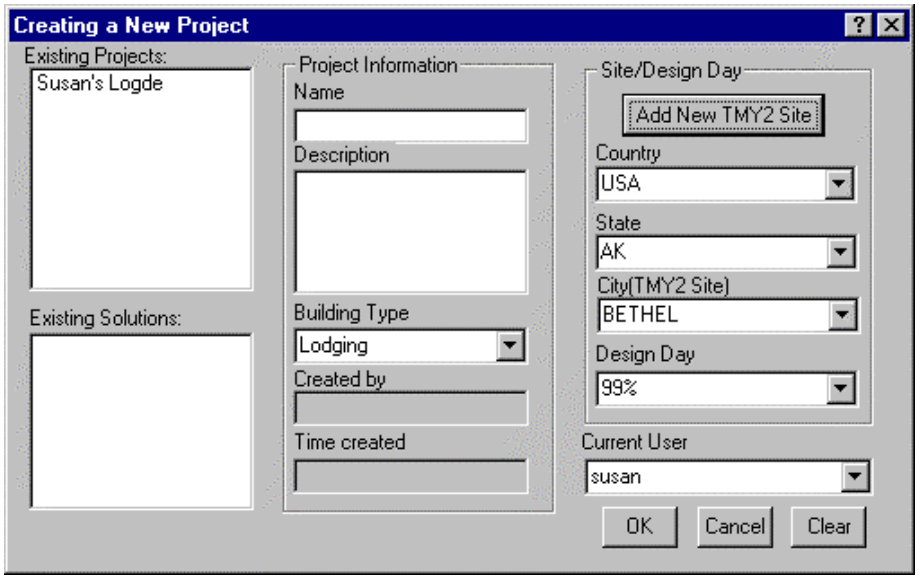
Project Overview

A BDA Design Project consists of a Site or location with specific weather information, a Building Type, and several design alternatives or Solutions. A project allows you to use SGE, BB, and DD to formulate and compare different solutions. Once the Project is created, the Site and the Building Type cannot be changed because the Prototypical Value Selector bases its choices mainly on the Building Type and Site parameters. If you want to change the Site or the Building Type, you might as well create another project.

User's Guide to the Project Dialog

To Create

To create a BDA Design Project. Select New... from the Project menu. A "**Create a New Project Dialog**" will open.



Project Dialog

You must specify a unique **name** for each Project. If you wish you may also provide a short **description** to help identify each Project during browsing. A **Building Type**, **Country**, **State**, **City** and **Design Day Percentile** are specified by default. If you wish to design something other than a Lodging building in Bakersfield, California, then you must select the appropriate Building Type and Location from the drop down lists. In this version of the BDA there are three states and different cities within each state. There are also three different building types under the Building Type list. There is the restaurant, lodging, and office structure. **NOTE**: at this time the **Design Day Percentile** is defaulted to **99 %** in RESEGY so do not bother changing it.

BDA keeps track of who created the Project, when it was created, and all the users who have changed it since its creation. BDA does this automatically by obtaining the user name of the currently logged in user. To help this mechanism, you should always log in as yourself when making changes to a BDA project.

To Add TMY2 File

To add new TMY2 file, click on the "**Add New TMY2 File**" option on the upper right corner of the Project Dialog. A screen will appear showing all the TMY files under the BDAData. Select the new TMY2 file and a new **RMY** file will be generated for the energy and weather computation.

To Open

The Open Project option will only be available if previously saved project exist. To open a project, select the **Open** option from the **Project** menu. An **Open Project dialog**, similar to the Create Project one will appear. Select the project desired for opening within the **Existing Projects** box. If you are currently in another project and wanting to open another, you can still choose the **Open** option. BDA will close the one you are currently on and return to the **Open Project dialog**.

To Close

To close a project, select the **Close** option of the **Project** menu. If your project has not been saved, BDA will ask you whether you want to save your final. Once the project is saved the project will be closed.

To Delete

To delete a project, select the **Delete** option of the **Project** menu. A **Delete Project Dialog** will appear that is similar to the **Create Project Dialog**. Select the project needed to be deleted from the **Existing Project** box. Then click OK.

To

To rename a project, make sure you have closed the project for which you want to rename. Next select the Rename option of the Project menu. A Rename Project Dialog will appear. First highlight the project that should be renamed. Then type in the new name of the project.

To Export

To **Export** a project, select the Export option of the **Project** menu. An **Export Dialog** will appear. Select the project to be exported and type in the location of the export destination. A new folder should be created in order to prevent confusion. The name does not have to be identical to the project's. If the export destination is unknown click on the browse button in the dialog, select the desired destination, and then create a new folder for this project.

Note: When exporting a project, a folder under the name of the project is actually being transferred. Under that folder a **.bd** file with the name is the actual project. All the other material is the data. Therefore you can not change the name of the .bd file but you can change the name of the folder.

The user can compress a project folder with WinZip. WinZip can be downloaded from the web site : http://www.winzip.com. To compress a project folder, create a new archive. The archive's name does not have to be identical to the project name. Now at the top of the WinZip program, you should see the name of the new archive you just created. Now select the Add option and select the folder of your project. WinZip will now display and add all files within the folder. Now all files are zipped into one zip file.

Note: WinZip opens up all folders and adds all files within a folder.

To Import

To **Import** a project, select the Import option of the **Project** menu. An **Import Dialog** will appear. Click on Browse and select the **.bd** file from a project folder.

To Extract a project from a zipped file, first open the zipped file with WinZip. Then select the .db file and then select the Extract option. Then the computer will prompt you with the location of the file. Select the one desired and proceed.

Where Files are Stored

WARNING: do not **rename**, **delete** or **move** any file from the BDA home directory or any of its sub-directories unless expressly directed to do so by your **BDA support person**.

BDA Files

Your BDA home directory contains the executable application files for the BDA core program, SGE, DElight-ECM, and RESEGY as well as all their necessary application extension files or "DLLs". The Objectivity federated Database consisting of the Schema Database, the Components Libraries Database, and any Project Database that you create during your design session are also located in the BDA home directory.

BDADATA Directory

The BDA home directory has one sub-directory called **BDADATA.** The **BDADATA** directory has two sub-directories, the "**wx**" and "**results**" directories. **DO NOT delete** or **rename** this directory or any of its files or sub-directories. **BDADATA** also has other files, see next few sections.

Weather Files

BDA weather files reside in two places. The **TMY2 weather files** for the six locations provided with BDA and the two generic atmospheric-moisture and atmospheric-turbidity files – "**atm_mois.gen**" and "**atm_turb.gen**" respectively -- are in the **BDADATA** directory. Design Day information required by RESEGY in the "**BDADesDay.txt**" file is also located in the **BDADATA** directory. Additional weather files required by RESEGY are located in the "**wx**" sub-directory of the **BDADATA** directory.

Schedule Files

The availability and occupancy schedule files – "***.avl**" and "***.occ**" respectively -- are located in the **BDADATA** directory.

Result Files

All result files produced by the BDA's Simulation Tools are placed in the "**results**" sub-directory of the **BDADATA** directory. The result files are overwritten automatically when results are recalculated and removed when a Solution or Project is removed.

Building Browser

BB Overview

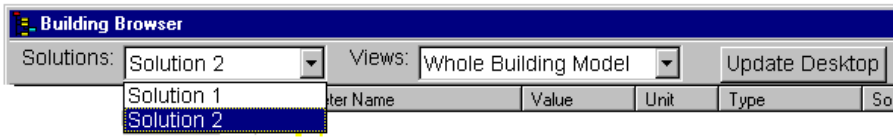
The Building Browser allows users to quickly navigate through the multitude of descriptive and performance parameters addressed by the analysis and visualization tools linked to BDA. Most of the parameters are set by default. Through the Building Browser the user can edit the values of input parameters and select any number of inputs and output parameters to display in the Decision Desktop.

To Open BB Window

To open the Building Browser window, click on the Building Browser tool.

To open the Building Browser window, select the **BB** item of the BDA **Windows** menu or click on the **Building Browser tool** of the BDA tool bar.

At the top of the Building Browser, you can see the **Solutions** drop down list to the left, the **Views** drop down list in the middle and the **Update Desktop** button at the right. The Solutions list shows all the Project's existing Solutions. The Views list shows the possible custom views of the Building Model.



NOTE: at this time there is only one view available, the **Whole Building Model** view.

The Building Browser uses the same paradigm as the Microsoft Explorer/File Manager utility. The **left pane** of the Building Browser displays the Design Object instances and their relationships. **Left Clicking** on a Design Object's icon in the **left pane**, displays its related Design Object instances at the top and parameters at the bottom of the **right pane** of the Building Browser.

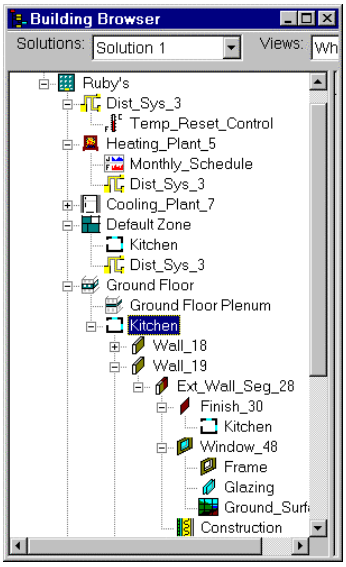
Design Objects

Navigating Building Objects

Each Design Object Type has a specific **icon** to identify it visually. Clicking on the **plus sign** to the left of an icon, **expands** that Design Object instance and displays its related Design Object instances below and slightly right indented to the icon.

Clicking on the **minus sign collapses** the expanded Design Object and unlike the Microsoft paradigm, does not preserve the expanded hierarchy within it.

As you open more and more objects in the BDA Building Model, you will notice the obvious hierarchical relationships (parent-child) between Building and Stories, Stories and Spaces, Spaces and Boundaries, Boundary Segments and Apertures (Windows), Windows and Glazing etc.



Left Pane of Building Browser

The plus sign to the left of the Design Object Icon indicates that it has children. When a parent Design Object is deleted then all of its children are also deleted. Childless Design Objects have no plus sign.

Other relationships can occur between Design Object instances which are not hierarchical in nature. For example, several Thermal Zones can "**use**" or "**used_by**" the same Distribution System or each Thermal Zone can use more than one Distribution System. The removal of a Thermal Zone has no effect on the Distribution System that it used, nor does the removal of a Distribution System affect the existence of any Thermal zone that was using it.

Spaces and Thermal Zones have a similar relationship where the Space is "**contained_in**" or "**contains**" a Thermal Zone and yet if the Thermal Zone is deleted, the Space is NOT deleted. Notice that the children of such auxiliary relationships are indicated as dead ends (the Design Object Icon does not have a plus sign indicating any further relationships) in the Building Browser hierarchy to prevent the confusion of endless cycles.

The relationship between a finish and the Space that is **"faces"** or "**faced_by**" is also a dead end and is displayed so that the user can identify which Finishes to change when "repainting" a Space.

Spaces and its features have "**has**" or "**had_by**" relationships where one feature is initialized due to the space. So if the space is deleted, all of its features are deleted as well. Each owner has one and only one feature of a particular Object type.

For definitions of the relationships, see Property and Relationship Definitions

NOTE: at this time in the interest of saving memory storage space, only the internal Finishes are explicitly created in BDA. DElight does not model external Finishes on External Boundary Segments of Spaces. For RESEGY, all External Boundary Segments have their external Finishes' U-Value included in the Construction and all Interior Boundary Segments are considered adiabatic and not modeled at all.

Object Naming Conventions

At creation time, you must give a unique name to the **Project** and you also have the option to name each **Solution** (although the BDA will provide default names for Solutions). While designing, you must also name certain Design Objects in the BDA Building Model – **Stories**, **Spaces**, and **Thermal Zones**. Other Design Object Types are created automatically by BDA and their names are also generated automatically.

The **Site** is always given the name of the **city** in which the project is located.

The **Building** (BDA supports only one Building per Project at this time) is given the **Project's name**.

Plenums are named by concatenating the name of the Stories to which they belong with the word Plenum (e.g. Ground Floor Plenum).

You name stories, Spaces, and Thermal Zones.

Boundaries, **Boundary Segments** and **Apertures** are named by concatenating the name of their Prototypes with their unique Object Id (e.g. Wall_12, Floor_35, Ext_Wall_Seg_107, Int_Wall_Seg_149, or Window_77).

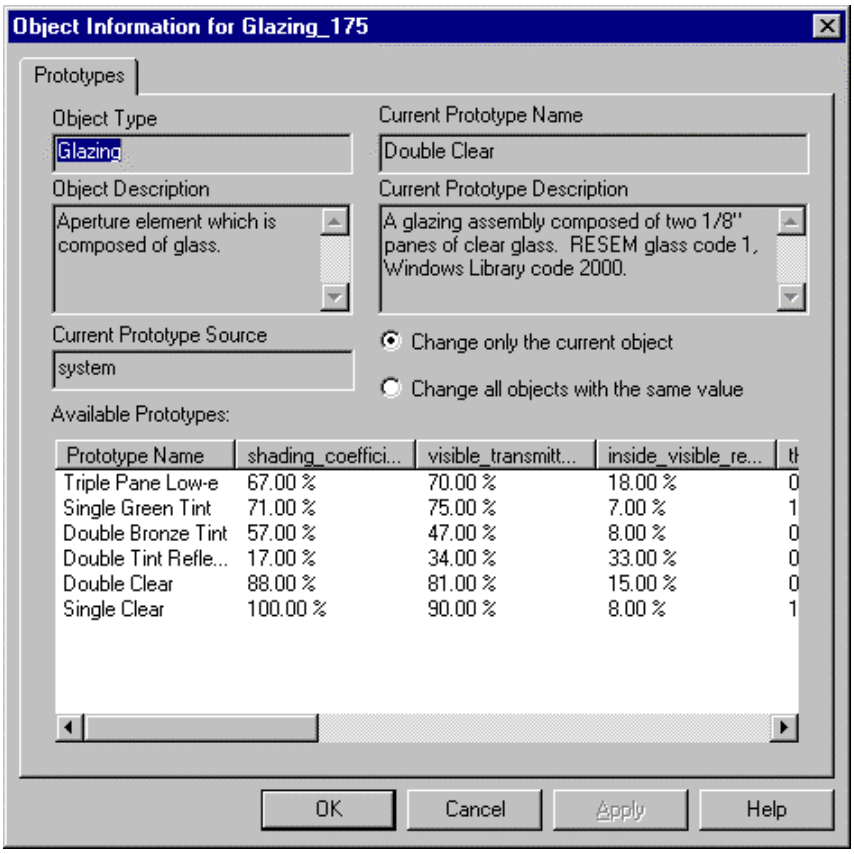
Distribution Systems, **Heating Plants**, and **Cooling Plants** are named by concatenating their Object Type with their unique Object Id (at this time, BDA only supports one Distribution System, one Heating Plant and one Cooling Plant per Building)

Other Design Objects which are always "only children" of their parents (i.e. only one of their Object Type can be "had by" the parent Design Object) are named by their Object Type name (e.g. **Construction**, **Frame**, **Glazing**, **Ground Surface**, **Hourly Schedule** and **Monthly Schedule**).

Although internal wall segments can have two **Finishes**, the Prototypes names for Finishes were too long and to name finishes we decided to concatenate the Object Type name with the Object Id.

Editing Values of Objects

Right click on the Design Object icon, select the **Properties** menu option and the **Object Information Dialog** opens.



Object Information Dialog

Notice the **Object Type** and a description of the Object Type queried from the Schema Database as well as the list of Available Prototypes. Both the **Object** and the **Current Prototype** have descriptions following them. If the Default Value Selector selects the Prototype, then the Source will show as **system**. If the prototype is selected by the user when creating the building, the **Current Prototype Source** should designate the name of the user

The list of available **Prototypes** can be sorted in **ascending** order on the values of any single parameter by **left clicking** on the parameter name at the top of each column. Clicking on the other lists will also sort their values in alphabetical or ascending order.

Select the new Prototype by left **clicking** on its **name**. If you want the new Prototype applied to this Glazing only, then click the **Change only the current object** radio button. If you want the new Prototype applied to all Glazing with the same old Prototype value as this Glazing then click on the **Change all objects with the same value** radio button. Finally click the OK button to complete the change and close the Object Information Dialog.

The parameter values displayed are sorted numerically, even if the values do not have the same number of digits. For example, under this scheme, 100.00 % sorts as less than 8.00%.

Parameters

The **right pane** of the **Building Browser** has **five** fields: **Parameter Name**, **Value**, **Unit**, **Type**, and **Source**.

Both related Design Object instances and parameters are displayed in the right pane with the Design Objects always at the top and the parameters always below.

Starting at the leftmost column of the pane, the Design Object instances have their familiar icons and then their instance name. In the **Value field**, the Design Objects have their Prototype names, the **Unit field** is blank and the **Type field** contains their Object Types. If the Design Object instance was created by as a result of your drawing in SGE, then your user name is in the **Source field**. If BDA created the Design Object by default, then **system** is in the Source field.

For parameters, starting at the left most column, you first see the **checkboxes** that you can check if you wish to place the parameter "on the Desktop". Next you see the **icon** indicating whether the parameter's value was set by the system (computer icon) or by you (user icon), then the actual **parameter name**. The **value** of the parameter is displayed in the **Value field** and the **unit** for that value is displayed in the **Unit field**. The **type** of the parameter displayed in the **Type Field** (descriptive, derived, geometry or performance) determines where its values can come from. If the value is provided by the Components Libraries Database, then the Source field contains the name of the Reference Organization or Volume (e.g. ASHRAE, BOCA, etc.). If you provided or selected the value, then the Source field contains your **user name**.

NOTE: If a value is not an integer, a real number, or a string then the Value field may contain a string which is the name of the file where the value (real array or table, bitmap, audio or video clip) is actually located.

Descriptive Parameters have values which are either loaded from the Components Libraries Database or entered by the user either by selecting a Prototype using the Object Information Dialog or in some cases by using the Parameter Information Dialog. If the value was loaded from the database, then the icon to the left of the parameter name looks like a small computer monitor, and the source field displays the source from which the value was obtained. Once you change the value, then the parameter icon changes to a human profile and your user name appears in the Source field.

Derived Parameters occur at the Site only, have values that are loaded from the TMY2 weather files or from the **BDADesDay.txt** file and are always represented by computer icons.

Geometry Parameters have values that are derived from your drawing in SGE and are always identified with the user icon and your user name.

Performance Parameters have no values until they are placed "on the **Desktop**" and the appropriate Simulation Tool calculates their values. They are always identified with the computer icon and if a value has been calculated then their Source field contains the name of the Simulation Tool that produced the calculation.

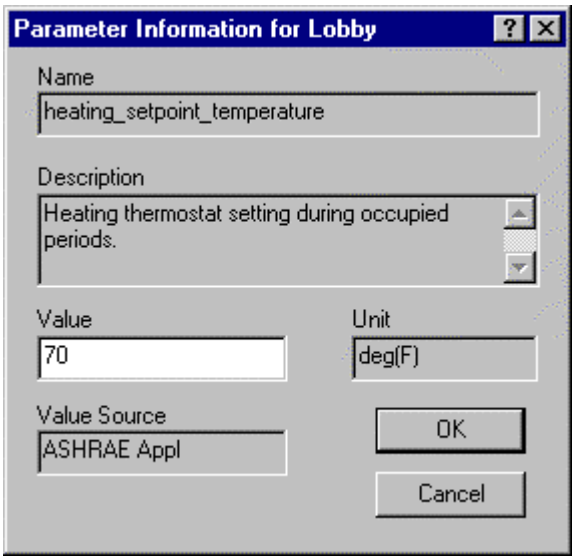
NOTE: at the present time, you can change the value of **all** the **Descriptive Parameters** in the **Space**'s parameter list which are all real numbers and only **two** parameters in the **Building**'s list, **daylighting_run_month** and **daylighting_run_hour** which are both integers. At this time you cannot change the units of any parameter's value.

Sorting Parameters

Parameters can be sorted in **ascending order** on any one single field at a time by clicking on the column's name. The parameter values can be sorted alphabetically and numerically.

Editing Values of Parameters

To modify the parameter values that were initially set up by default, **right click** on the **parameter icon**. Then select the **Properties…** menu option from the right click menu to open the **Parameter Information Dialog.** Enter the new value and click **OK.**

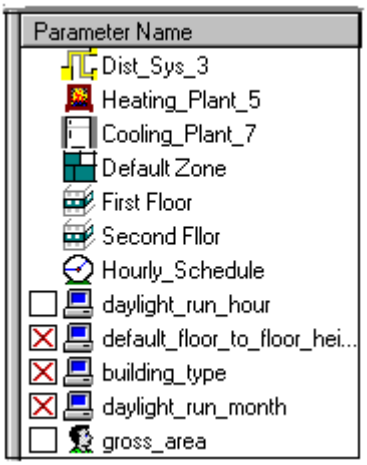


Parameter Information Dialog

Note that the **name** and **description** of the parameter is displayed as well as its **value, value source**, and **unit**. You can enter the desired new value in the appropriate edit field. Clicking on the OK will complete the change and close the Change Parameter Real Value Dialog.

Selecting Parameters for the Desktop

To select parameters for display on the Desktop, click in the **checkbox** to the left of the parameter's icon. A red "X" should appear indicating that the parameter has been selected. Keep selecting parameters from other Design Objects and when finished click the **Update Desktop** button. This will place all the parameters that you selected "on the Desktop".



Red "X"s appear when selecting the Parameters

Customizing the Browser

Defining Custom Views

Only one view is available at this time, the Whole Building Model View, which displays all the Design Object instances involved in your design. Two other views, the Glazing View and the Thermal View, have not yet been implemented.

Design Decision Desktop

DD Overview

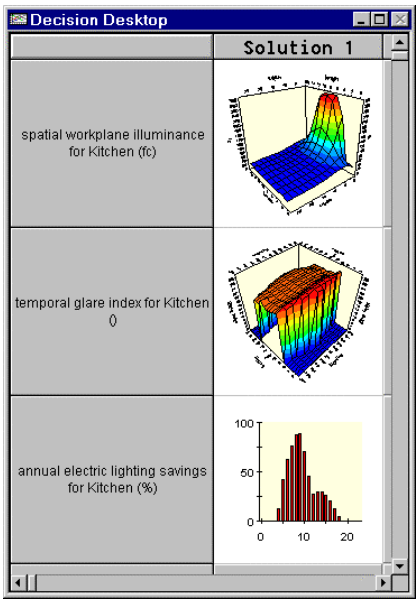
The Design Decision Desktop or simply Desktop is the GUI element which helps you to compare the performance of your design alternatives. The concept is very simple – the **columns** represent design Solutions and the **rows** represent individual Performance Parameters whose values will be or have been calculated by the Simulation Tools. To remind yourself of important values that you may have changed in a Solution, you can also place Descriptive Parameters in the Desktop.

Calculate the Selected Results

To calculate values click the Calculate tool.

To calculate the values of Performance Parameters that you have placed on the Desktop select the **Calculate Results** menu option of the BDA **SimTools** menu or click the **Calculate tool** on the BDA tool bar.

The appropriate Simulation Tools are invoked transparently by BDA to calculate values for the Performance Parameters currently on the Desktop and the results are displayed in the corresponding cells of the matrix.



Desktop with calculated results.

Double clicking in any result cell of the Desktop that contains a graph, will open a large window in which you can change the settings and orientation of the result graph as well as print the contents of the window.

Parameters

Parameters are represented as rows in the Desktop.

Adding Parameters

To add a parameter to the Desktop, navigate through the Building Model in the **left pane** of the **Building Browser** until you find the Design Object instance of your choice. Click on its icon to display its parameters in the **right pane** of **the Building Browser** and then select the parameters that you wish to add to the Desktop by **clicking** in the **checkbox** to the left of each parameter's icon. Once you have selected the desired parameters, **click** on the **Update Desktop** button and each parameter will be added to the Desktop.

Moving Parameters

At this time, parameters cannot be moved in the Desktop. If you wish parameters to appear in a certain order then you must select them in that order. Otherwise remove the parameters and then add them in the appropriate order desired.

Removing Parameters

Removing parameters from the Desktop is essentially the reverse of adding them, navigate through the Building Model using the Building Browser until you find the parameter that you wish to remove, then click its checkbox to uncheck it and then click the **Update Desktop** button.

Solutions

Solutions are represented as columns in the Desktop.

Creating New Solutions

When you create a new Solution in SGE, it is automatically added as a new column to the right of the last Solution column in the Desktop. The new solution would maintain all of the parameters selected from the last solution created. You can select the parameters accordingly.

Moving Solutions

At this time, Solutions cannot be moved in the Desktop.

Deleting Solutions

When you delete a Solution in SGE, then its corresponding column is automatically deleted from the Desktop

Editing Desktop Graphics

If you **double click** in any Design Desktop cell, it will expand into a larger **Graphic Display window** whose contents can be customized, saved to a file or printed. Clicking on the **Settings… button**, opens the 3D, 2D Settings Dialog, or the Schedule Settings. See “The 3D Graphic Settings Dialog” on page 40, “The 2D Graphic Settings Dialog” on page 42, and “Graphical Display for Schedules” on page 41.

3D Graphics Settings

The 3D Settings Dialog lets you select the **type** of graph that you want, and whether to display the **title** and the **legend**. You can also edit the title text and the maximum value displayed (Z-value). See “The 3D Graphic Settings Dialog” on page 40.

2D Graphics Settings

The 2D Settings Dialog lets you select the type of graph that you want, and whether to display the title and the legend. You can also edit the title text. See “The 2D Graphic Settings Dialog” on page 42.

Schedule Settings

Like the 2D Setting Dialog, you can modify the graphs for Schedule Design Desktop cells. The same Setting Dialog as the 2D Settings. But unlike the values of the regular parameter settings, schedules can be changed. See “Graphical Display for Schedules” on page 443.

Customizing the Desktop

At this time, customizing the Desktop is limited to resizing its rows and columns.

Resizing Rows and Columns

To resize a **row**, place the cursor over the line below the row. When the cursor changes from a cross to a line between two arrows, hold the left mouse button down and drag the line up or down to change the height of the row.

To resize a **column**, place the cursor over the line to the right of the column up in the column-heading row. When the cursor changes from a cross to a line between two arrows, hold the left mouse button down and drag the line to the left or right to change the width of the row.

Object and Parameter Information Dialogs

Object Information Dialog Overview

The **Object Information Dialog** may have two tabs. The **Prototypes** tab is always present and it displays general information about the Object Type instance and its currently selected Prototype as well as a list of other available Prototypes. The **Geometry** tab is present only for those Design Object instances that have geometric values that are not apparent from their display in SGE.

Prototypes Tab

The **Prototypes Tab** displays a Design Object instance's **Object Type,** and **Description** (from the Schema Database). The Prototypes Tab also shows the **Name**, **Description**, and **Source** of the **Current Prototype** selected for that Design Object instance. Below that, the Prototypes Tab displays the list of **Available Prototypes** and the two radio buttons for Local versus Global changes. See "Change the Glazing Type" on page 33.

Geometry Tab

The **Geometry Tab** shows the **Object Type**, **Object ID**, **Object Instance Name**, **Azimuth**, **Tilt, Area**, **Volume**, and a **list of Vertices** for the selected Design Object instance. Since all of these values can be edited indirectly by drawing in the SGE, the Geometry Tab is **read-only**. See "Examine the Geometry of an Aperture" on page 35.

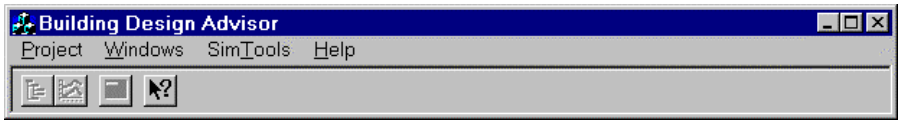
Parameter Information Dialog Overview

The **Parameter Information Dialog** displays the **Name** and the **Description** or definition of the parameter from the Schema Database, the current **Value** of the Parameter and the canonical **Unit** if appropriate. To change the value of the parameter, type in the new value and click the **OK** button. See "Change the Thermostat Settings" on page 36.

Tutorial

Launch the BDA Application

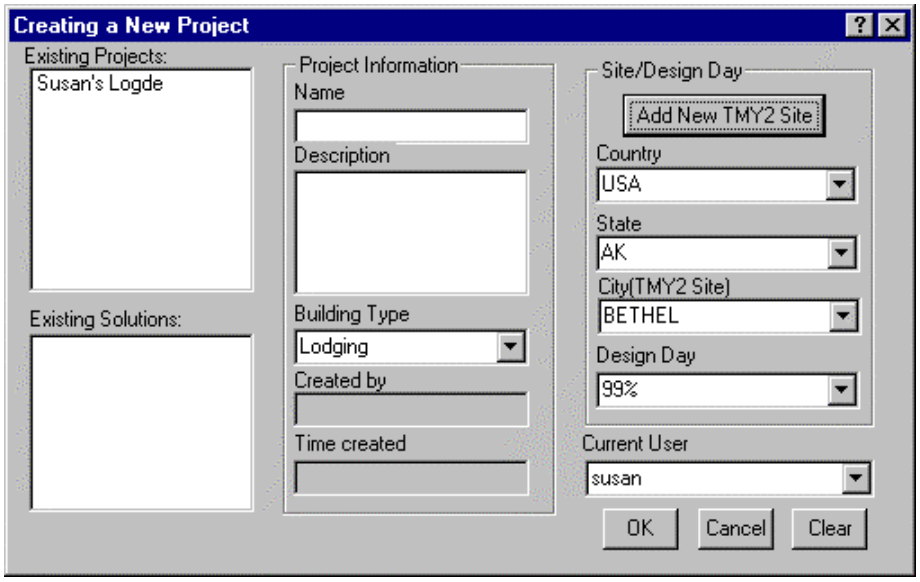
You can launch the BDA application either from the Windows® **Start** menu through the **Programs** menu item and the BDA sub-item, or through the Windows® Explorer. BDA comes up in the upper left corner of your screen.



Main BDA Window

Create a new project

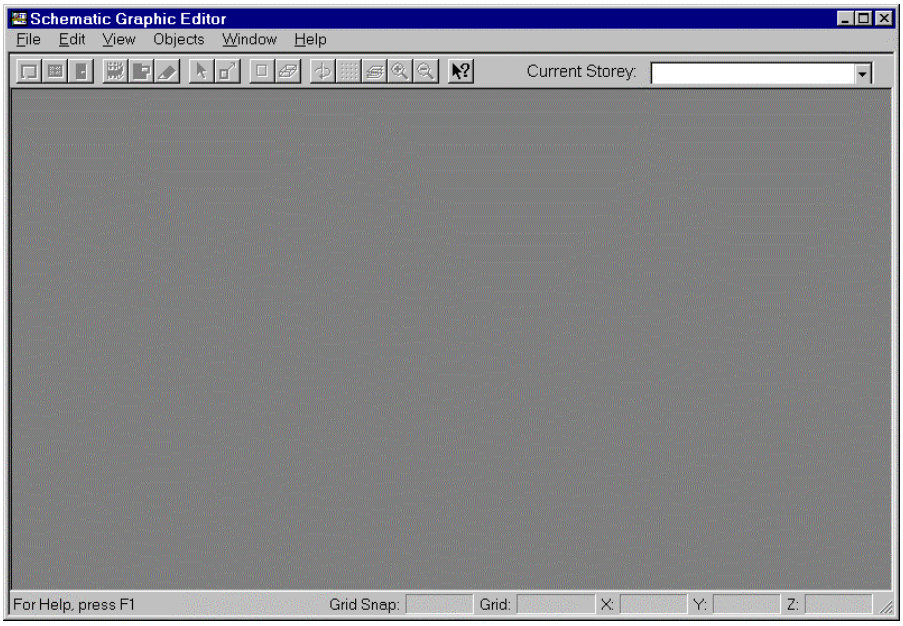
Select the **New…** menu item from the **Project** menu of the BDA window to open the **Creating a New Project Dialog**.



New Project Dialog

Enter a **name** for the new building design project along with an optional brief **description**. Choose the occupancy type for the new design from the **Building Type** drop down list and the location from the **Country**, **State** and **City** drop down lists. At present, the **Design Day Percentile** is set to 99% by default. The BDA automatically assigns the name of the logged user as the **Current User**. When done, click the **OK** button.

BDA will create the new Project and Site and launch the **Schematic Graphic Editor (SGE)**. SGE comes up as a large window just below BDA's main window.



Main SGE Window

Add New TMY2 Site

To add a new TMY2 (weather files the RESERGY can use to calculate energy uses), you should click the "**Add New TMY2 File**" option on the upper right corner of the Project Dialog. A screen will appear showing all the TMY files under the BDAData. Select the new TMY2 file and a new RMY file will be generated for the energy and weather computation.

Note: The name of the generated RMY files are the name of the city.

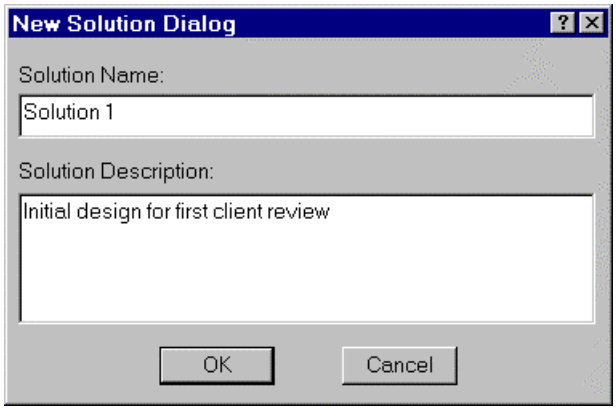
Save as DXF

If you want to save a solution as a DXF file, select the Save as DXF in the File menu of the SGE menu.

Create a New Solution in SGE

Select **New Solution** from the **File** menu in **SGE**. **SGE** will bring up the **New Solution Dialog** through which you can specify a **name** for the new solution along

with an optional brief **description**. When done, click **OK**. SGE will open a new window with a black background and a grid for the new solution.



New Solution Dialog

Create a New Stories in SGE

To create a new Story, click on the Story tool.

Before you can create a space, you will need to create a story. You can do that either by clicking on the **Story tool** in the SGE tool bar, or by selecting the **Story** sub-item of the **Create** menu item of the **Object** menu in SGE. The **New Story Dialog** should appear on the screen, allowing you to specify a **name** for the new story, its **level**, **height**, optional **plenum** and **plenum height**.

New Story Dialog

Note: By default, roofs are created with each story. BDA allows only one story.

Check the Drawing Settings in SGE

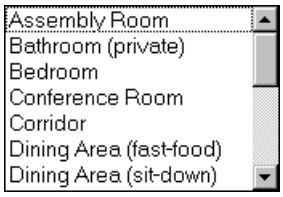
To adjust the Drawing Settings, click on the Drawing Settings tool.

The information bar at the bottom of the SGE window shows the Grid Snap interval, the Grid Snap state and the x-y-z coordinates of the cursor. You can change the grid settings either by clicking on the **Drawing Settings tool** in the SGE tool bar, or selecting the **Drawing Settings…** menu item of the **View** menu.

Draw a Space in SGE

.To create a Space, click on the Space tool.

To draw a space in the current story, either click on the **Space tool** in the SGE tool bar, or select the **Space** sub-item of the **Create** item of the **Object** menu. Select a space type from the drop down list of space types that the BDA knows about.



Select a space type from this list.

Once you have selected a space type, the cursor will turn into a cross and you can draw a space using the mouse. Click once to specify the beginning point of the wall segments that will define the new space. Drag the mouse to draw a wall. Click again to end a wall segment and continue with another. Remember that at this time the BDA and DElight can only model **rectilinear spaces** (spaces where all the angles are 90 degrees). If you want to erase the last segment drawn, press the **ESC** button. Double clicking at any point will close the resulting polygon to define the space.

Enter the space name in this dialog.

A **Space Name Dialog** will appear, allowing you to specify a name for the new space. Once you click **OK**, then the name of the new space appears on the screen as a graphic object attached to the cursor. Before anchoring the name to the space, you can move the name to any place you want within the space by moving the mouse, you can **increase** or **decrease** the **font size** by using the "**+**", or " **–** " **keypad** keys and you can rotate the name's orientation by using the <**Ctrl-R**> combination. When you are satisfied with the name's position, you can anchor the name to the space by clicking the left mouse button. Once you have positioned the name, changing the size and orientation is no longer possible.

Draw a window in SGE

To create a Window, click on the Window tool.

To draw a window in SGE, first you have to select one of the existing spaces by clicking on it. The best way to select a space is to left click on its name. Once selected, the corners of the space will be highlighted with selection handles (small red square marks). Once you have selected the space that will accept the new window, either click on the **Window tool** of the SGE tool bar, or select the **Window** sub-item of the **Create** menu item of the **Object** menu. Click on the location where you want the window to be initialized. Next move the cursor up to the endpoint of the window and double click. A window will form on the wall in turquoise color.

NOTE: selection handles do not automatically go away. To avoid the confusion of having more than one space selected at one time, be sure to **deselect** any selected space by clicking anywhere outside of the building perimeter to get rid of the selection handles before adding another space or before selecting another space.

To directly go to an object in Building Browser from the SGE, right click on the object

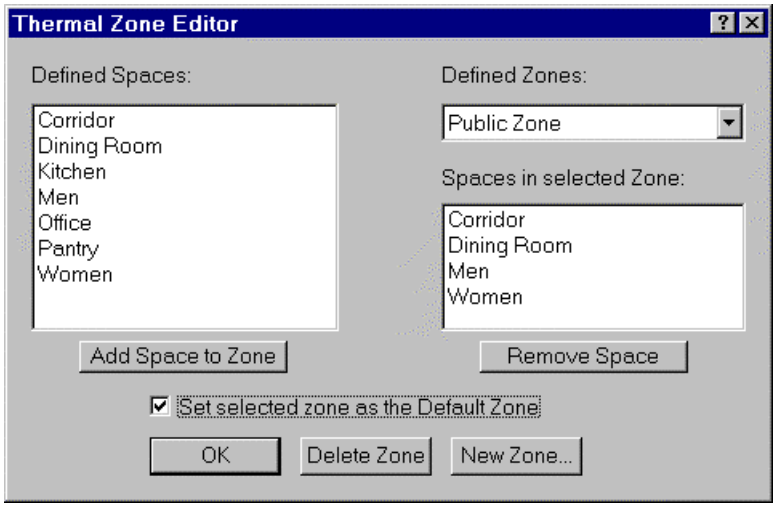
Edit Thermal (HVAC) Zones in SGE

RESEGY models Spaces as sub-units within **Thermal (HVAC) Zone**s, which are served by Distribution Systems carrying the outputs from the Heating and Cooling Plants. When the first Solution is created, a Default Thermal (HVAC) Zone is automatically created and all the Spaces subsequently created are automatically placed in the Default Thermal (HVAC) Zone.

A Space can exist in only **one** Thermal (HVAC) Zone at a time but a Space does **not** have to belong to any Thermal (HVAC) Zone. Any Space not in a zone will not be included in the RESEGY energy calculations for the Building.

To edit Thermal Zones, click on the Thermal Zone tool.

To edit existing Thermal (HVAC) Zones or to create additional Zones, click on the **Thermal Zone tool** on the SGE tool bar or select the **Thermal Zone** menu option of the **Create** menu option of the SGE **Objects** menu. The **Thermal Zone Editor** will open.



Thermal Zone Editor

Notice the **Defined Spaces** list at the upper left of the Editor Dialog, it shows all the Spaces in the current Solution. In the upper right corner is the **Defined Zones** drop down list of all the Thermal Zones. Just below that you can see the list of all the Spaces presently contained in the above selected Zone.

To remove a Space from the selected Zone, merely select the Space in the list and click on the **Remove Space** button. You can select more than one Space for removal by holding down the <Ctrl> key while selecting each Space.

To add Spaces to the currently selected Zone, select the Spaces in **the Defined Spaces** list and click the **Add Space to Zone** button just below the list.

To **add** a new Thermal (HVAC) Zone, click the **New Zone** button, enter the new Zone's name in the **Name Dialog** that opens and click **OK**.

To **delete** an existing Thermal (HVAC) Zone make sure the right Zone is selected in the **Defined Zones** list, click the **Delete Zone** button and click **Yes** on the verification Dialog.

Before leaving the Thermal Zone editor make sure to click **the Set the selected zone as the Default Zone** radio button so that SGE and the BDA core program know into which Zone any subsequently created Spaces are placed.

Select Objects in SGE

Select Object Tool

To select an object, click on the object directly. Selection handles do not automatically go away. In order to avoid confusion of having more than one space selected; be sure to deselect any selected space by clicking on the **Select Object tool.**

Moving Objects in SGE

Move Object Tool

To move an object to another position on the solution grid, first select the object (see "Select Objects in SGE" on page 30. Next click on the **Move Object tool** from the tool bar or select **Move** under the **Object** menu**.** Now the mouse cursor appears as a cross on the solution grid. Click on the mouse once to tell it you are ready to move the object. Now wherever the cursor goes, the object should move as well. Double click the mouse at the position of where you want the object to be located.

Zoom-In in SGE

To zoom in, select the Zoom In Tool

To zoom in on any particular point of the **Solution Grid**, click on the **Zoom In tool** from the tool bar or select **Zoom In** from the **View** menu. Next select one corner of where you want to zoom in. Move the mouse cursor around until you box the area desired. Now double click the mouse and the screen will zoom in on the solution grid. You can **Zoom In** as frequent as desired.

Zoom-To-Fit SGE

To zoom back to the original size where everything fits, click on the Zoom-To-Fit Tool

To convert the Solution Grid back to the original size where every object would fit within the grid, click the **Zoom-To-Fit tool** from the tool bar or select **Zoom-To-Fit** from the **View** menu.

View Options in SGE

To switch to plan(2-D) view, click on the Plan View Tool

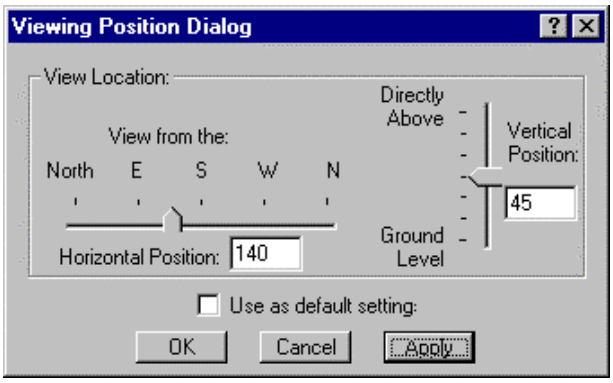
SGE by default sets the Solution to the **Plan View**, a 2 dimensional view. Whenever you want to switch back from another view to the Plan one, just select the **Plan View tool** from the tool bar or select **Plan View** sub-item from the **Change View** item of the **View** menu.

To switch to a 3-D view, click on the Isometric View Tool

To switch your view to the **Isometric** or 3-D view, you can either select the **Isometric View tool** from the tool bar. Or you can select the **Isometric View** sub-item from **Change View** item from the **View** menu.

To rotate view in the Isometric View, click on the Viewer Position Setting Tool

While in the Isometric View, the viewing position can be changed by the following. First click on the **Viewer Position Setting tool** from the tool bar or select the **Set Viewing Position** item from the **View** menu. A **Viewing Position Dialog** will appear. From the dialog, select the desire viewing position either from the **vertical position** or the **horizontal** or both. An exact degree of position can be typed in or change the angle by moving the position cursors to the desired level. Be sure to select the **Apply** to see the modified solution.

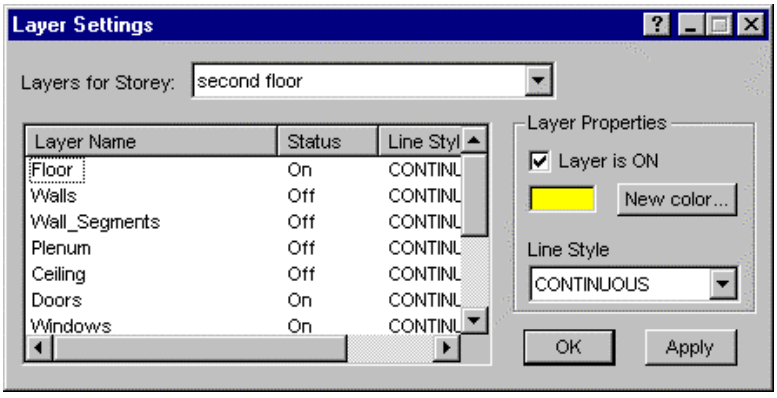


Viewing Position Dialog

Modifying Layer Settings in SGE

To modify the Layer Settings, click on the Layer Settings Tool

To change layer settings and other properties, select the **Layer Settings tool** from the tool bar or select **Layer Settings** from the **View** menu. A **Layer Settings** dialog will appear. On the left side of the dialog, each layer's **Name**, **Status**, and **Line Style** are shown. To change the setting, select the layer that is desired and change its properties on the **Layer Properties** on the right. The layer's color and its line style can be modified. And when finished, be sure to select **Apply** to save your changes.

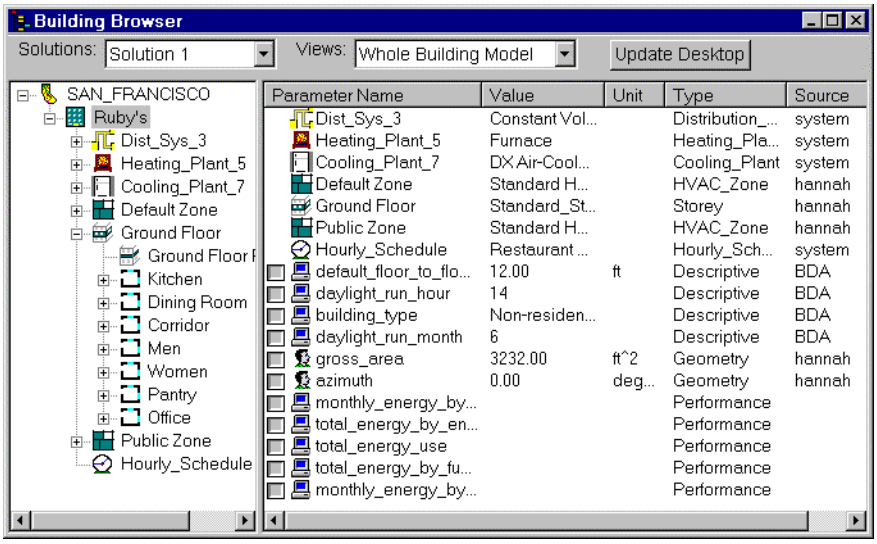


Layer Setting Dialog

Open the Building Browser

To open the Building Browser, click on the Building Browser tool.

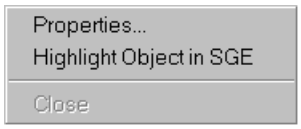
To open the Building Browser window, select the **BB** item of the BDA Windows menu or click on the **Building Browser tool** of the BDA tool bar. The Building Browser uses the same paradigm as the Microsoft Explorer/File Manager utility. The **left pane** of the Building Browser displays the Design Object instances and their relationships.



The Building Browser

Each Design Object Type has a specific icon to identify it visually. Clicking on the **plus sign** to the left of an icon, expands that Design Object instance and displays its related Design Object instances below and slightly indented to the right of its icon.

Left Clicking on the Design Object **icon**, displays its related Design Objects and parameters in the **right pane** of the **Building Browser**. Notice that the parameters are sorted according to type (Derived, Descriptive, Geometry, and Performance).



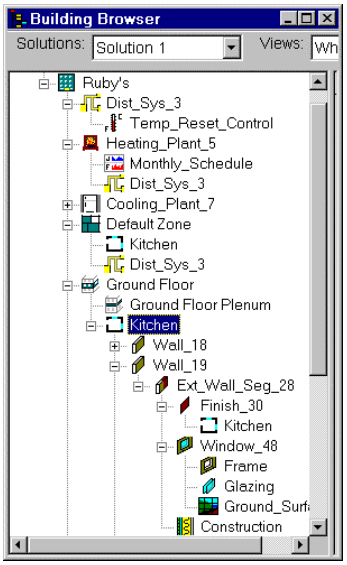
The right click menu.

Right clicking on the Design Object **icon** causes a **right click menu** to appear. If you select the **Properties** menu option, then the Object Information Dialog will appear. Select the **Highlight Object in SGE** menu option. If the Design Object is one of those Objects that SGE knows about, **two** changes occur. **One**, a **red star** appears in the building Browser to the left of the Design Object icon. **Two**, in SGE that Design Object's color changes to a bright **magenta pink**.

NOTE: Subsequent-redrawing events in SGE may dim the bright pink highlighting.

To turn off the highlighting, **right click** again on the highlighted Design Object icon in the Building Browser and select the **UnHighlight Object in SGE** menu option.

Navigate Through the BDA Building Model



Left Pane of Building Browser showing different types of relationships in the BDA Building Model

As you open more and more objects in the **BDA Building Model**, you will notice the obvious hierarchical relationships (parent-child) between Building and Stories, Stories and Spaces, Spaces and Boundaries, Boundary Segments and Apertures (Windows), Windows and Glazing etc. The plus sign to the left of the Design Object Icon indicates that it has children. Childless Design Objects have no plus sign and when a Design Object is deleted then all of its children are deleted.

Other relationships can occur between Design Object instances which are not hierarchical in nature. For example, several Thermal Zones can "**use"** the same Distribution System or each Thermal Zone can use more than one Distribution System. The removal of a Thermal Zone has no effect on the Distribution System that it used, nor does the removal of a Distribution System affect the existence of any Thermal zone that was using it.

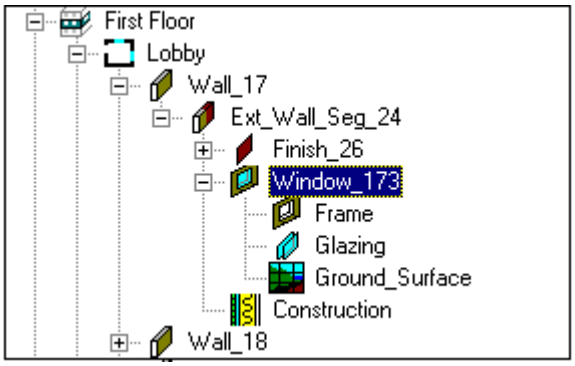
Spaces and Thermal Zones have a similar relationship where the Space is **"contained_in"** a Thermal Zone and yet if the Thermal Zone is deleted, the Space is NOT deleted. Notice that the children of such auxiliary relationships are indicated as dead ends (the Design Object Icon does not have a plus sign indicating any further relationships) in the Building Browser hierarchy to prevent the confusion of endless cycles.

The relationship between a Finish and the Space that is **"faces"** is also a dead end and is displayed so that the user can identify which Finishes to change when "repainting" a Space.

NOTE: at this time, in the interest of saving memory storage space, only the interior Finishes are explicitly created in the BDA. DElight-ECM does not model exterior Finishes on External Boundary Segments of Spaces. For RESEGY, all external Boundary Segments have their exterior Finishes' U-Value included in the Construction U Value and all internal Boundary Segments are considered adiabatic and not modeled at all.

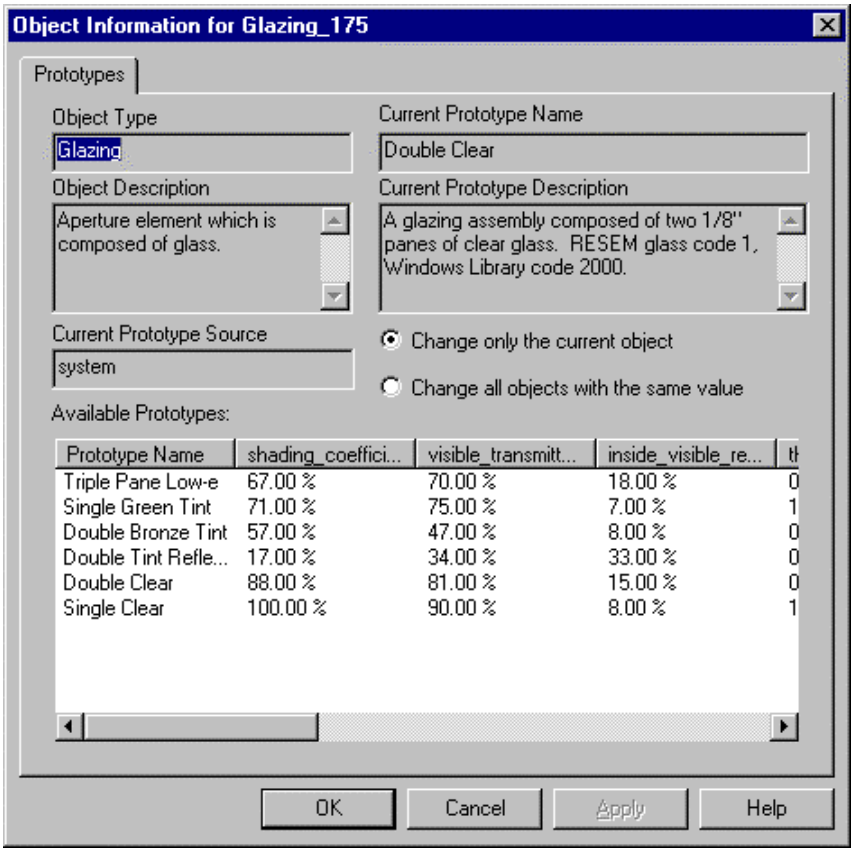
Change the Glazing Type

Open the **Building Browser** and expand the Building to reveal its Stories. Expand a Story to reveal its Spaces. Expand a Space to reveal its Boundaries. Expand a Boundary to reveal its Boundary Segments (e.g., Wall_). Expand an external Boundary Segment (eg.,Ext_Wall_Seg) to reveal its Apertures (Windows). Expand a Window to reveal its related Design Object instances – Glazing, Frame, and Ground Surface.



Expansion of Building Browser

Right click on the **Glazing icon**, select the **Properties** menu option and the **Object Information Dialog** opens.



Object Information Dialog

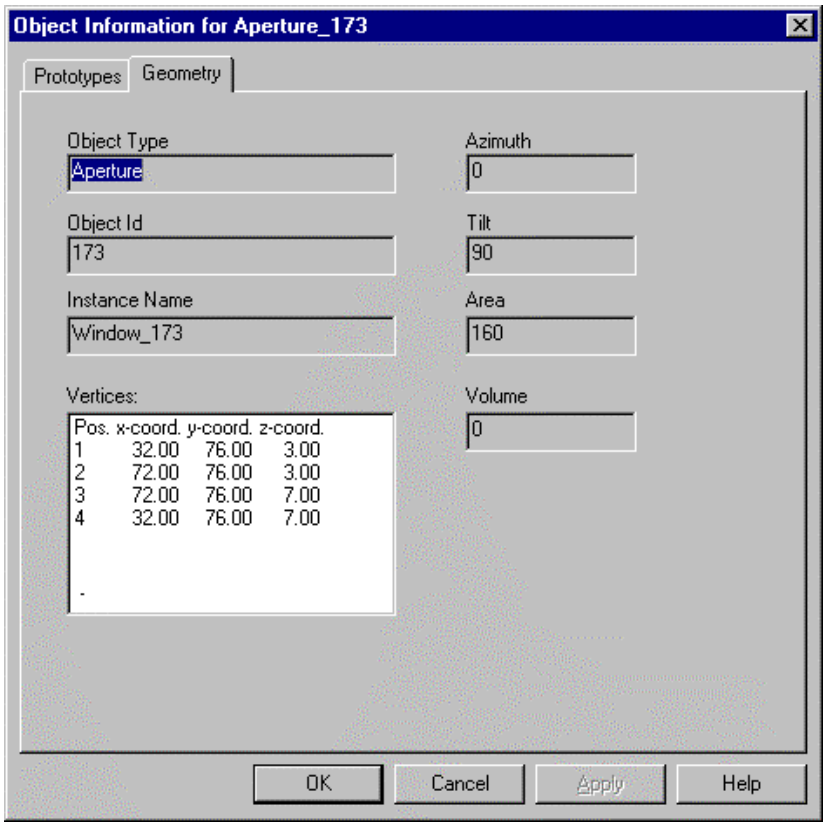
Note the information displayed about that Design Object instance -- the Object Type and a description of the Object Type queried from the Schema Database. Also displayed is the current Prototype name and description queried from the Components Libraries Database. If the Default Value Selector selects the Prototype, then the Source will show as **system**.

The list of available **Glazing Prototypes** can be sorted in **ascending** order on the values of any single parameter by **left clicking** on the parameter name at the top of

each column. Select the new Prototype by clicking on its name. If you want the new Prototype applied to this Glazing only, then click the **Change only the current objec**t radio button. If you want the new Prototype applied to all Glazing with the same old Prototype value as this Glazing then click on the **Change all objects with the same value** radio button. Finally click on the **Change Prototype** button to complete the change and close the Prototypes Selection Dialog.

Examine the Geometry of an Aperture

In the left pane of the Building Browser, expand a Space with windows and expand each Wall and External Wall Segment until you find a Window. **Right click** on its **icon**, select the **Properties** menu option of the **right click menu** to open the **Object Information Dialog** and select the **Geometry** tab. The **Object Geometry** dialog will display.

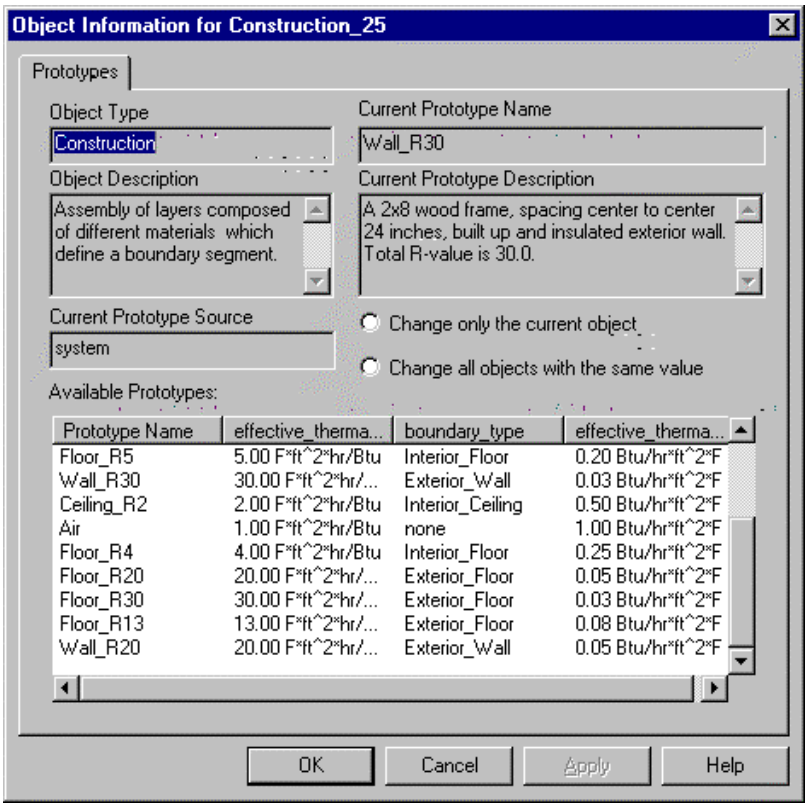


Object Geometry Dialog

The **Geometry Dialog** shows the **Azimuth**, **Tilt, Area**, **Volume**, and a **list of Vertices** for the Aperture. Since all of these values can be edited indirectly by drawing in the SGE, the Geometry dialog is **read-only**.

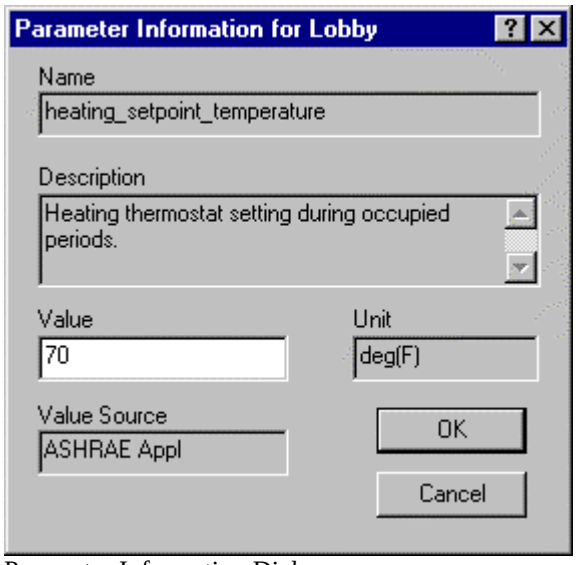
Prototypes for Constructions

The Object Information for Constructions is different from all of the Information box. Due to the numerous boundary types, the construction will only consist of the wall components.



Change the Thermostat Settings

Expand the Building to display its Stories, expand a Story to display its Spaces. **Left click** on one of the Space icons to display its parameters in the right pane of the Building Browser. **Right click** on the **heating_setpoint_temperature's icon**. The right click menu appears and when you select the **Properties** menu option, **the Parameter Information Dialog** opens.



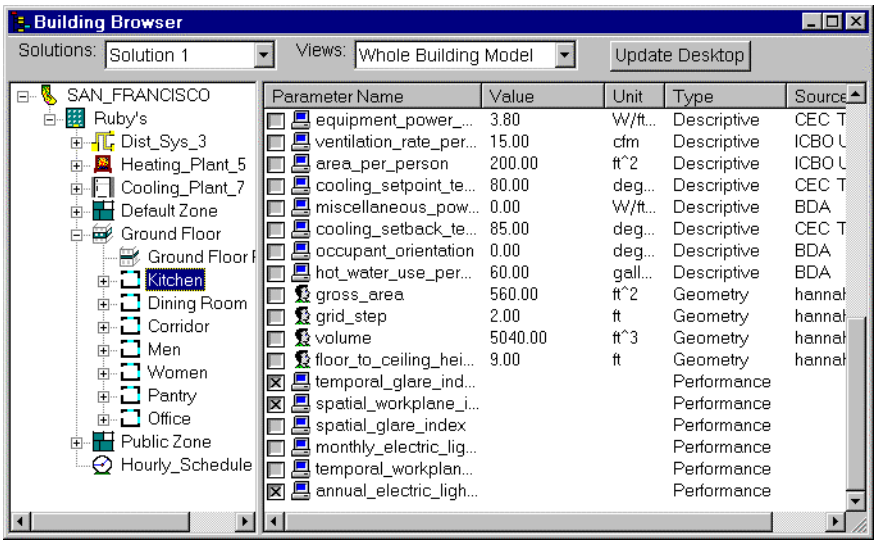
Parameter Information Dialog

Note that the name and description of the parameter is displayed as well as its value, value source, and unit. You can enter the desired new value in the appropriate edit field. Clicking on the OK will complete the change and c lose the Change Parameter Real Value Dialog.

Select Parameters to Display "On the Desktop"

To calculate the value for a given Performance Parameter, you must place the parameter "**on the Desktop**". This is done by clicking in the **checkbox** found at the extreme left of all parameters in the **right pane** of the **Building Browser**. When you have selected all the parameters that you want displayed in the Desktop, then click the **Update Desktop button** and each parameter will now occupy a row in the Desktop.

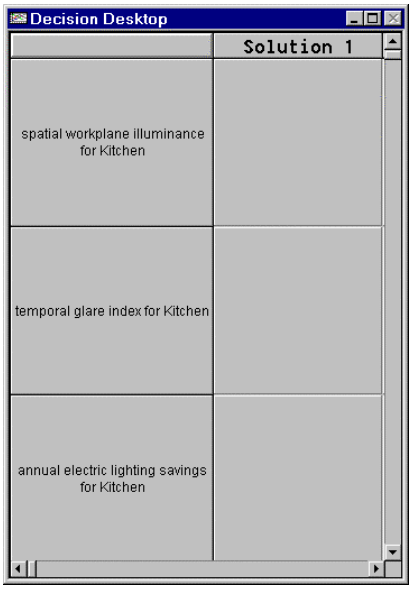
Note: When the user selects a parameter that exists in more than one solution, by selecting the parameter in one solution automatically selects the parameter in other solutions.



Notice three Performance Parameters are checked.

To open the Desktop, click on the Desktop tool.

If the Desktop is not open, you can open it by clicking the **Desktop tool** in the BDA main tool bar or by selecting the **DD** menu option of the BDA **Windows** menu.



Desktop with uncalculated Performance Parameters

The first column of the Desktop displays the names of the Parameters that you selected earlier. The second column represents the first Solution and contains an empty cell for each Performance Parameter selected.

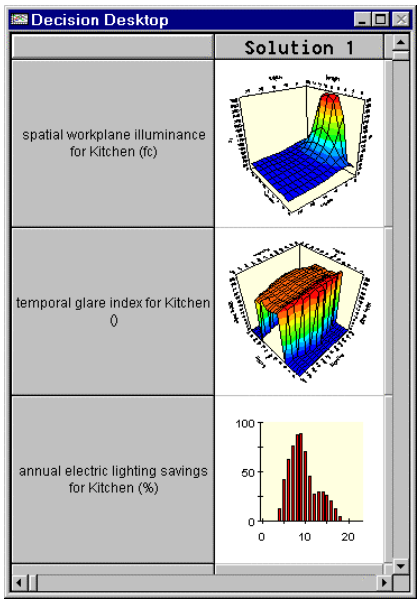
Calculate Values of Selected Parameters

To calculate values click the Calculate tool.

To calculate the values of Performance Parameters that you have placed on the Desktop select the **Calculate Results** menu option of the BDA **SimTools** menu or click the **Calculate tool** on the BDA tool bar.

Users can also right-click on the desktop column that corresponds to a certain solution to calculate the result files of that solution.

The appropriate Simulation Tools are invoked transparently by BDA to calculate values for the Performance Parameters currently on the Desktop and the results are displayed in the corresponding cells of the matrix.



Desktop with calculated results.

Double clicking in any result cell of the Desktop that contains a graph, will open a large window in which you can change the settings and orientation of the result graph as well as print the contents of the window.

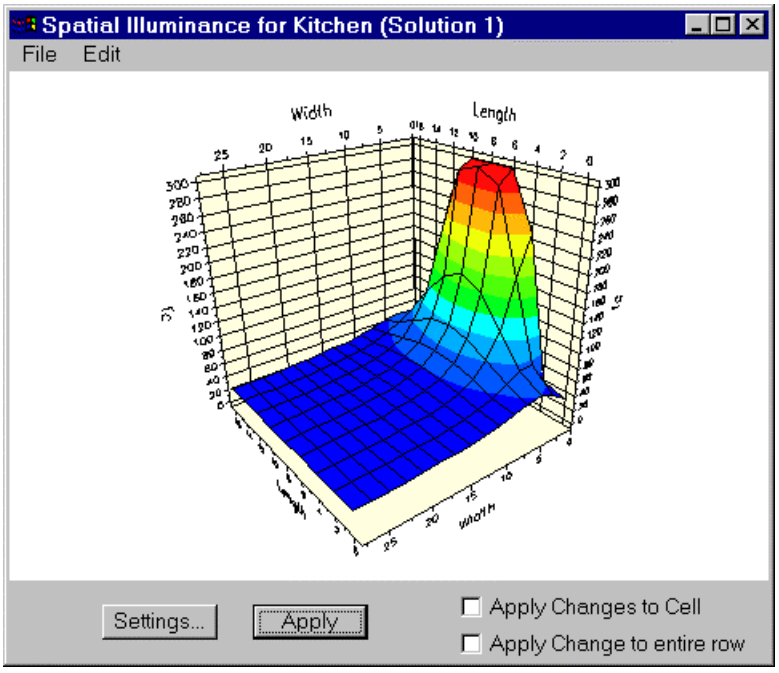
Edit the Graphical Display of Results

Once the Graphical Display window is opened, notice the **file** and **edit menus** at the left of the window bar, the two buttons at the bottom left and the two check boxes at the bottom right. The **file menu** can be used to save the contents of the Graphical Display window to a file or to send it to a printer. The **edit menu** can be used to copy the contents of the Graphical Display window to the clipboard in three different formats, bitmap, metafile, or enhanced metafile.

The Graphic Display window can display 3D or 2D graphs with the axes appropriately labeled and a legend that guides you in interpreting the information displayed.

3D Graphical Display Dialog

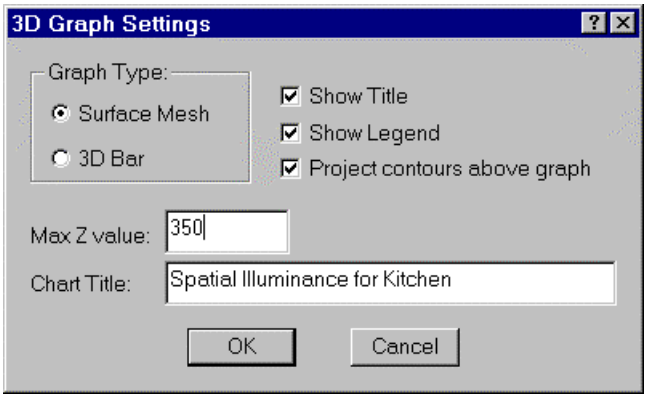
3D Graphs plot a table of values against two separate axes. To manipulate the Graph, click **both mouse buttons** over the image and, while holding both buttons down, use the mouse to rotate the Graph into the desired position. To change the settings of the Graphical Display window, click on **the Settings… button**. The **Settings Dialog** will open and you may customize the title, header, legend and graph type.



3D Graphical Display Dialog

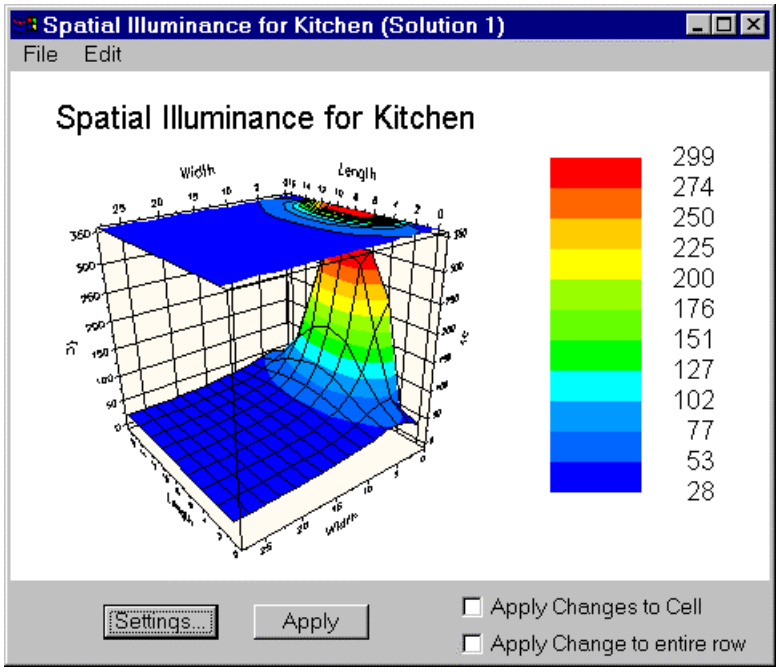
The 3D Graphic Settings Dialog

In the 3D Graph Settings Dialog, you can select the type of graph (Surface Mesh or 3D Bar), whether or not to display the Title and/or Legend, and whether or not to project the contours above the graph. You can also choose the maximum cutoff or Z-Value.



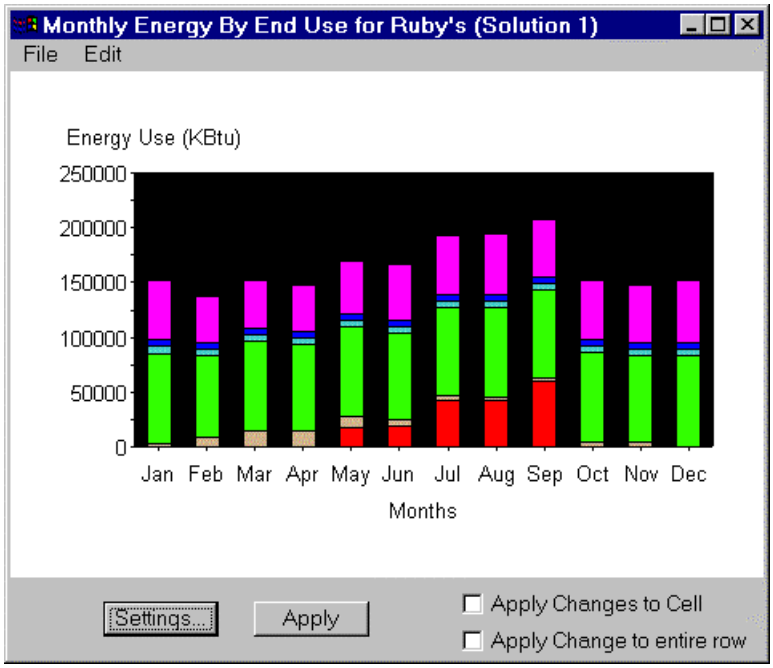
3D Graph Settings Dialog

Once you are satisfied with the changes, click **OK** to close the 3D Graph Settings Dialog. To apply changes to that cell or to the entire row of cells in the Design Desktop select the appropriate check box at the right and click **Apply**.

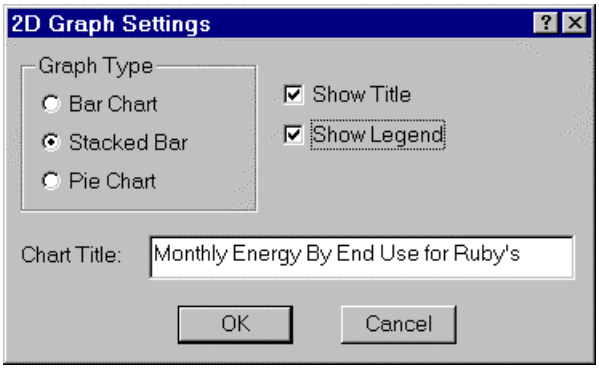


3D Graphics Display Dialog after settings have been changed and applied

2D Graphical Display Dialog



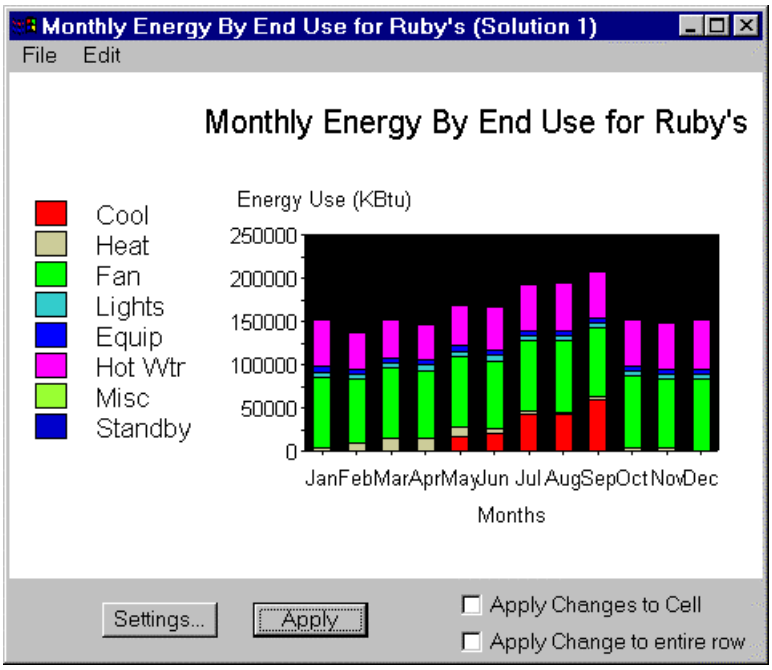
The 2D Graphic Settings Dialog



2D Graphics Settings Dialog

In the 2D Graphic Settings Dialog, you can select the graph type and whether to show the title and the legend or not. You can also change the chart title to whatever you want.

When you are satisfied with the changes, click **OK** and return to the 2D Graphical Display window.

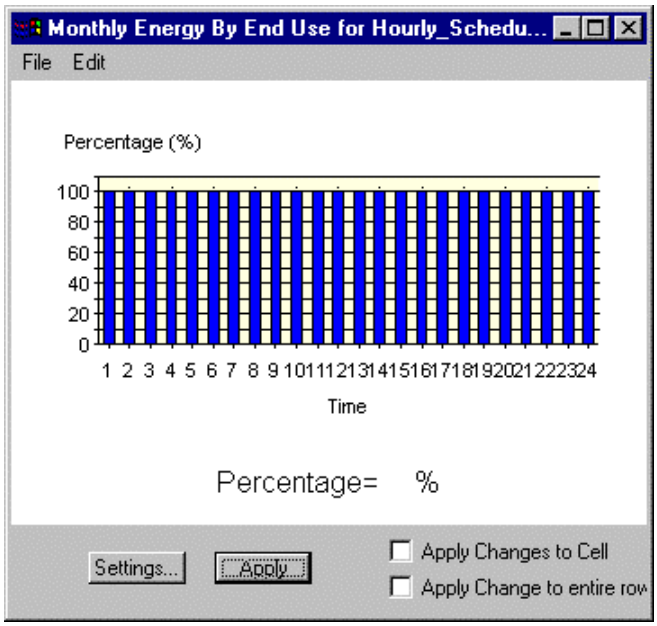


2D Graphics Display Dialog after settings have been changed and applied

The Desktop displays graphs for schedules as well as other selected for parameters. For schedules only, the Desktop allows the user to modify the data graphed.

Graphical Display for Schedules

The **Graphic Display Dialog for Schedules** shows similar data as the **2D Graphical Display**. But since it represents the schedule of a specific parameter, the values in the graphs can be modified. When modifying, click on the bars with the left click. Hold the mouse and change the height of the graph to the represent the appropriate value. When the graphs are changed, the default values used in schedule are automatically modified.



Graphic Display Dialog for Schedules

Create a New Solution

Whenever you are satisfied with the current state of your design and wish to save it for further work or to compare it with other alternatives, you should create a new design Solution. This saves a snapshot of your design and lets you discard changes that you make in the new Solution by simply deleting it rather than having to backtrack and recreate your original design.

NOTE: if you wish to save calculated results obtained for a particular design alternative, you should definitely save that Solution and create a new Solution for any further changes or recalculations.

To create a new solution, select the Solution window that you wish as the source for the copy. Then select the **New Solution** menu option of the SGE **File** menu, either accept the default name of the new solution or give it a name of your choice and fill in an optional description. Clicking **OK** will create a new Solution child window in the main SGE window. The new Solution will be an exact copy of the Solution that was the current Solution at the time of the copy. You can spawn a new Solution from any previously created Solution.

NOTE: At this time, there is **no UNDO in BDA**. All changes are final for the current Solution.

Modify the Current Solution

One you have created a new Solution, it automatically becomes the current Solution and you can make some modification such as adding or deleting Design Objects or changing Prototypes or parameter values.

Recalculate Values of Selected Parameters

When you create a new Solution in SGE, an equivalent copy is done in BDA and another column is created in the Desktop. Whatever parameters were on the Desktop in the source solution, their exact copy will also be on the Desktop in the new Solution.

Recalculating values for the selected Performance Parameters in the new Solution is as easy as clicking the Calculate button of the BDA tool bar. The new calculated values will appear in the empty cells of the new Solution column.

Save the Solution

You can choose to save any individual Solution during the design session by selecting the **Save Solution** menu option of the SGE **File** menu. When you are ready to close the Project, delete any Solutions whose contents you do not want to save. This will also remove all the result files generated by calculations done on those Solutions.

Save the Project

When you **close** a project or **exit** BDA, you will be asked whether you wish to save this project or not. If you answer **yes**, then any changes made since your last Save will be saved to the Projects Database.

If you answer **no**, then the state of the Project Database will remain the same as it was after your last Save. If you experimented with a Solution and made some **calculations** based on those changes, do not abandon the changes by not saving them to the database **at this point**, since the result files have already been overwritten and there is **no undo** to go back to the previous state. The best thing to do is to save the Solution and delete it later or cancel the close or exit and delete the Solution now and then save or close the Project. This is why any experimentation should be done on a New Solution that can be discarded if it proves to be unsatisfactory.

Open an Existing Project

Select the **Open** menu option of the BDA **Project** menu. When the **Open a Project Dialog** opens, click on the name of the Project that you wish to open in the existing Projects list in the upper left-hand corner of the Dialog. The selected Project's information will be loaded in the Dialog and if you click **OK** that Project will be opened, loaded into BDA and SGE will be launched.

If you open another project while currently in one, BDA will return close the existing project and return to the **Open Project Dialog**

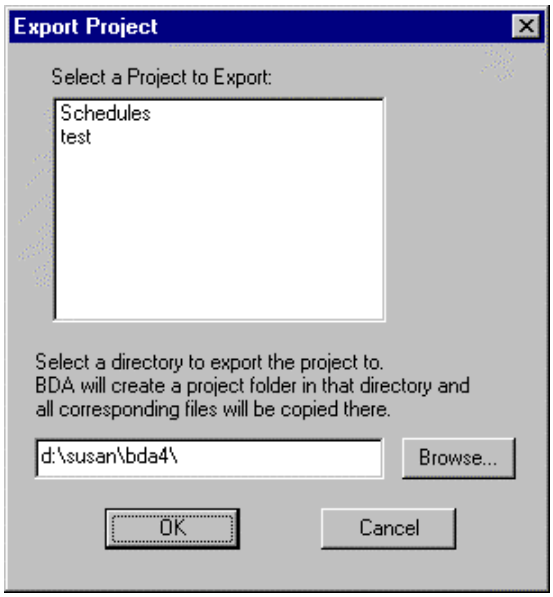
To Rename a Project

To rename a project, make sure you have closed the project for which you want to rename. Next select the Rename option of the Project menu. A Rename Project Dialog will appear. First highlight the project that should be renamed. Then type in the new name of the project.

When importing a project whose name is already in use, rename the project.

To Export a Project

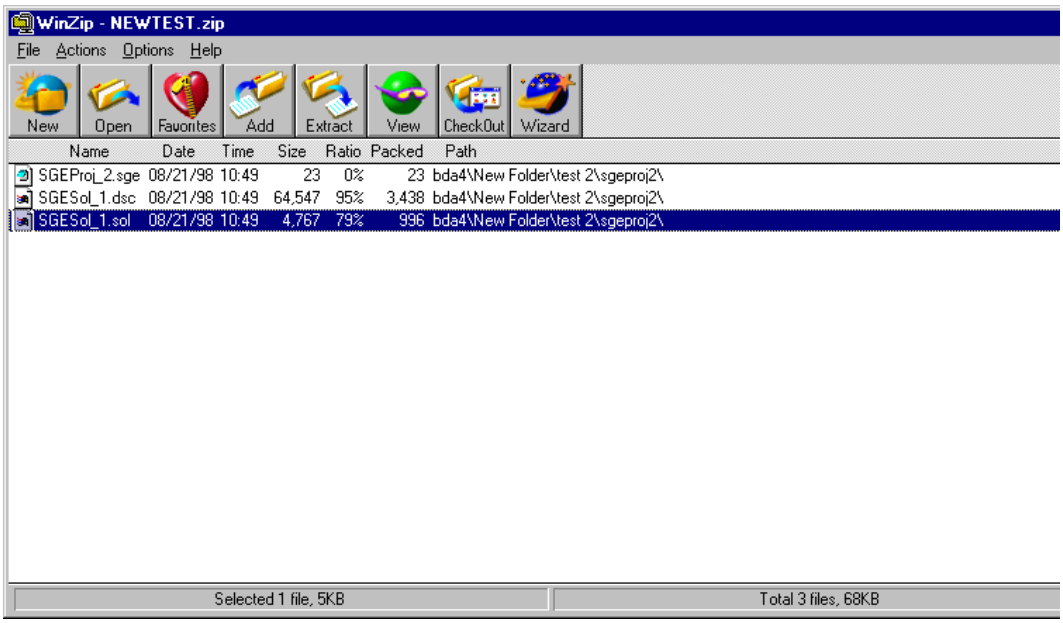
To Export a Project, select the export option of the BDA Project menu. An **Export Dialog** will appear. Select the project to be exported and type in the location of the export destination. If the export destination is unknown, click on the browse button in the dialog and select a directory.



Export Project Dialog

Note: When exporting a project, a folder under the name of the project is actually being transferred. Under that folder a **.bd** file with the name is the actual project. All the other material is the data. Therefore you can not change the name of the .bd file but you can change the name of the folder.

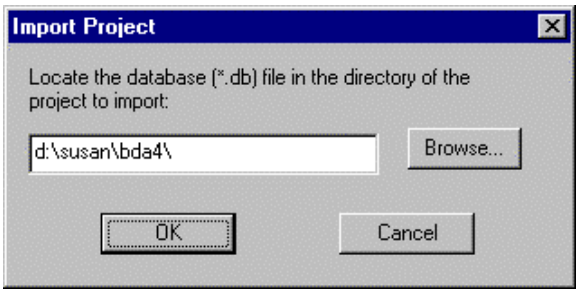
To **Zip** up a project prior to Export, use the **WinZip** program. WinZip can be downloaded from the web site : http://www.winzip.com. To compress a project folder, create a new archive. The archive's name does not have to be identical to the project name. Now at the top of the WinZip program, you should see the name of the new archive you just created. Now select the Add option and select the folder of your project. WinZip will now display all folders and drives. When selecting a folder to add, WinZip opens the folder and displays all the files. By selecting add, all files will be added to the archive.



WinZip dialog box

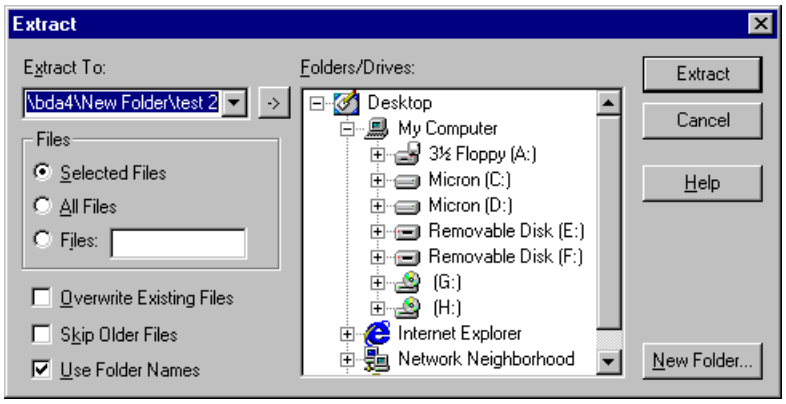
To Import a Project

To **Import** a Project, select the import option of hte BDA Project menu. An Import Dialog will appear. Click on **Browse** and select the **.bd** file from a project folder.



Import Project Dialog

To **Extract** a project from a zipped file, first open the zipped file with WinZip. Then select the .db file and then select the Extract option. Then the computer will prompt you with a Extract dialog box. Select the folder or drive where you want to place the file. Finally click Extract to finish.



Extract dialog box

Glossary of Terms

Air_volume_ratio

The ratio of space air volume to space geometric volume. Dimension: percentage.

Altitude

Height above mean sea level. Dimension: length.

Angular_dependence_coeff_of_trans1

First coefficient in the angular dependence equation for solar transmittance in glazings. Dimension: none.

Angular_dependence_coeff_of_trans2

Second coefficient in the angular dependence equation for solar transmittance in glazings. Dimension: none.

Angular_dependence_coeff_of_trans3

T coefficient in the angular dependence equation for solar transmittance in glazings. Dimension: none.

Angular_dependence_coeff_of_trans4

Fourth coefficient in the angular dependence equation for solar transmittance in glazings. Dimension: none.

Annual_electric_lighting_savings

Percentage of electric lighting savings that daylighting contributes for each month of a year. Dimension: percentage

Area_per_person

Average floor area per person in a space at maximum (100%) occupancy. Dimension: area

Atmospheric_moisture

Amount of precipitable moisture in the atmosphere at a particular site at a particular time. Dimension: moisture

Atmospheric_turbidity

Amount of aerosols (i.e. particulate pollutants) in the atmosphere. Dimension: none.

Azimuth

Angular distance from a reference location (usually 0 degrees). Dimension: plane_angle.

BDA

Building Design Advisor

BDA Building Model

The BDA Building Model represents the semantic network of the Design Object Types and all the possible Relationships between them.

BDA Schema

All the Object Types, Parameters, Relationships, Simulation Tools and Units that BDA knows about.

Boundary_type

Type of boundary (exterior wall, interior wall, ceiling, floor, and roof). Dimension: none.

Building Design Advisor

Software environment for evaluating energy efficiency of building designs.

Building_type

Whether a building is Residential or Non-residential in its primary use. Dimension: none.

Cec_climatic_zone

One of 16 geographic areas in California for which the state Energy Commission has established prescriptive energy efficiency requirements. Dimension: none.

CLD

Component Libraries Database

Coefficient_of_performance

Ratio of the rate of heat removed or delivered to the rate of energy input for a complete plant unit or system. Represents efficiency of the plant or system. Dimension: none.

Component Libraries Database

This database contains prototypical instances or prototypes of some of the Design Object Types in the BDA Building Model.

Cool_coil_discharge_temperature

Designed exit air temperature of the system cooling coil. Dimension: temperature.

Cool_coil_max_discharge_temperature

Maximum coil exit air temperature achievable by reset or discriminator. Dimension: temperature.

Cooling_degree_days(50)

Annual cumulative difference between a site's mean daily temperature and 50 F. The difference is counted only if the mean daily temperature is above 50F. Dimension: degree_day.

Cooling_degree_days(65)

Annual cumulative difference between a site's mean daily temperature and 65 F. The difference is counted only if the mean daily temperature is above 65 F. Dimension: degree_day

Cooling_degree_hours(80)

Annual cumulative difference between a site's mean hourly temperature and 80 F. The difference is counted only if the mean hourly temperature is above 80 F. Dimension: degree_hour.

Cooling_setback_temperature

Cooling thermostat setting during unoccupied periods. Dimension: temperature

Cooling_setpoint_temperature

Cooling thermostat setting during occupied periods. Dimension: temperature

Cooling_tower_electricity_consumption

Total electricity consumption of the cooling tower during normal operation. Dimension: power

Daylight_run_hour

Hour of the day for which the DCM-ECM (Daylight) simulation runs the spatial calculation (acceptable values are 0-23). The day is assumed to be the 21st of the month. Dimension: none.

Daylight_run_month

Month of the year for which the DCM-ECM (Daylight) simulation runs the spatial calculation (acceptable values are 1-12). The day is assumed to be the 21st of the month. Dimension: none.

Daylighting Computation Module

Simulation Tool invoked by the BDA core program to calculate daylighting performance parameters at the individual space level for all selected spaces in a particular Design Solution.

Default_floor_to_floor_height

Default vertical distance between the floor of one storey and the floor of the storey above it. Dimension: length.

DElight

Daylight analysis module that computes daylight illuminance, glare values as new savings due to daylighting at the individual space level.

Depth

Distance that an aperture's fin or overhang projects from the building surface. Dimension: length

Design Objects

Real world physical objects or concepts that are part of a building design. Examples of physical objects are Glazing, Constructions, Heating Plants, etc. Examples of conceptual objects are Sites, Stories, Thermal Zones, Visual or Thermal Activities, etc.

Economizer_enthalpy_control

Value denotes whether or not the economizer enthalpy control is in effect (acceptable values are "yes" or "no"). Dimension: none.

Economizer_limit_temperature

Outside air temperature above which the economizer returns to minimum outside air operation. Dimension: temperature.

Effective_thermal_conductance

Thermal conductance of a construction assembly including all framing, edge and interstitial effects but excluding air film on both sides. Dimension: thermal_conductance.

Effective_thermal_resistance

Net thermal resistance of a construction assembly including all framing, edge and interstitial effects but excluding air film on both sides. Dimension: thermal_resistance.

Energy Computation Module

Simulation Tool invoked by the BDA core program to calculate energy use performance parameters at the building level.

Equipment_heat_to_hood_ratio

Fraction of heat from electrical equipment that is exhausted through a hood. Dimension: percentage

Equipment_power_density

Maximum installed equipment plug load power density in a space. Dimension: power_density.

Fan_control_type

Refers to the method by which the HVAC distribution system fans are controlled. Dimension: none.

Floor_to_ceiling_height

Vertical distance between a floor boundary and a ceiling boundary. Dimension: length.

Floor_to_floor_height

Vertical distance between two floor boundaries(includes the plenum if one exists). Dimension: length.

Fuel_type

Primary type of fuel used by plant equipment. Dimension: none.

Generation_capacity

Maximum equipment sustained power output. Dimension: power

Grid_step

Distance between the calculated reference points. X and Y values in a lighting grid are assumed to be equal. Dimension: length.

Gross_step

Area included within surrounding exterior walls exclusive of interior courtyard. Dimension: area

Hear_coil_discharge_temperature

Designed exit temperature of the system heating coil. Dimension: temperature

Heating_degree_days(65)

Annual cumulative difference between a site's mean daily temperature and 65 degrees Fahrenheit. The difference is counted only if the mean daily temperature is below 65F. Dimension: degree_day.

Heating_setback_temperature

Heating thermostat setting during unoccupied periods. Dimension: temperature.

Heating_setpoint_temperature

Heating thermostat settings during occupied periods. Dimension: temperature.

Hot_water_use_per_person

Maximum total domestic hot water usage per person exclusive of space heating or equipment process usage. Dimension: volumetric_flow.

Inside_visible_reflectance

Total inside (i.e. within a space) visible reflectance of a glazing assembly. Dimension: percentage.

Latitude

Angular distance from the plane of the equator to the site. Dimension: plane_angle

Layer_1

First layer in a Construction Material Sandwich. Dimension: none.

Layer_2

Second layer in a Construction Material Sandwich. Dimension: none

Layer_3

Third layer in a Construction Material Sandwich. Dimension: none

Layer_4

Forth layer in a Construction Material Sandwich. Dimension: none

Layer_5

Fifth layer in a Construction Material Sandwich. Dimension: none

Layer_6

Sixth layer in a Construction Material Sandwich. Dimension: none

Layer_7

Seventh layer in a Construction Material Sandwich. Dimension: none

Layer_8

Eighth layer in a Construction Material Sandwich. Dimension: none

Layer_9

Ninth layer in a Construction Material Sandwich. Dimension: none

Level

The actual position of a storey within the building, starting with 1 for the ground floor. Dimension: none.

Light_heat_to_space_ratio

Fraction of lighting energy added to the space energy balance as a sensible heat gain. Dimension: percentage.

Light_output_fraction_at_min_power

Fraction of light produced by an electric lighting system when the lighting control is a set at minimum power. Dimension: percentage.

Lighting_control_probability

Probability that the lighting control will dynamically respond in meeting lighting set point conditions. Dimension: percentage.

Lighting_control_type

Type of lighting control device used. Dimension: none.

Lighting_power_density

Installed lighting power density within a space. Dimension: power_density.

Lighting_setpoint

Desired lighting level for the type of visual activity occurring in a space or zone. Dimension: illuminance.

Longitude

Angular distance from the plane of the prime (Greenwich) meridian to the site. Dimension: plane_angle.

Mean_coinc_summer_wetbulb_temp

Mean wetbulb temperature coincident with the summer design day maximum drybulb temperature. Dimension: temperature.

Mean_daily_temperature_range

Mean daily temperature range during design day conditions. Dimension: temperature.

Mean_summer_coincident_humidity

Mean humidity ration coincident with the summer design day maximum drybulb temperature. Dimension: percentage.

Min_outside_air_per_person

Minimum outside air volumetric flow per person required in a space. Dimension: volumetric_flow.

Minimum_design_ventilation

Minimum design ventilation provided to an HVAC zone by a distribution system during occupied conditions. Dimension: percentage.

Minimum_drybulb_temperature

Minimum drybulb temperature experience by a site under design day conditions. Dimension: temperature.

Minimum_input_power_fraction

Minimum power fraction when the lighting system is operating at a minimum power. Dimension: percentage.

Minimum_outside_air_fraction

Minimum acceptable constant flow rate of fresh air expressed as a fraction of the total air supply. Dimension: percentage

Minimum_relative_humidity

Minimum allowable relative humidity in HVAC zones. Dimension: percentage

Miscellaneous_heat_to_hood_ratio

Fraction of heat from space miscellaneous equipment (e.g. a steam table), that is exhausted through a hood. Dimension: percentage.

Miscellaneous_power_density

Maximum miscellaneous equipment (e.g., steam table) power density installed within a space. Dimension:power_density.

Monthly_electric_lighting_savings

Percentage of electric lighting savings that daylighting contributes for each hour of an average day in each month of a year. Dimension: percentage.

Monthly_energy_by_end_use

Energy use of the building for each month broken down by end use such as space heating and cooling, fans, lighting, equipment, hot water, miscellaneous and plant. Standby. Dimension: energy.

Monthly_energy_by_fuel_type

Energy use of the building for each month broken down by fuel type such as electricity, gas, coal, #2 oil, #6 oil, district heating, district cooling, other and heating plant. Dimension: energy.

Monthly_values

Twelve values, one for each month of the year. Dimension: percentage.

Number_of_fins

Number of fins (i.e. vertical exterior shading projections) associated with the aperture. Dimension: none.

Number_of_overhangs

Number of overhangs (i.e. horizontal exterior shading projections) associated with the aperture. Dimension: none.

Number_of_steps_in_stepped_system

Number of steps (i.e. lighting level settings) in a stepped lighting system. Dimension: none.

Number_of_units

Total number of heating or cooling generation units in a plant. Dimension: none.

Occupant_orientation

Direction toward which the occupant of a space is facing. Dimension: plane_angle.

Occupied_infiltration_rate

Infiltration rate during "occupied conditions." This infiltration rate generally refers to the rate when the HVAC system is "on." Dimension: volumetric_flow.

Operation_type

Value denotes how the plant operates (acceptable values are "continuous" or "as needed"). Dimension: none.

Outside_high_limit_temperature

High limit outside temperature at which coil reset begins. Dimension: temperature.

Outside_low_limit_temperature

Low limit outside temperature at which coil reset stops. Dimension: temperature.

Parameter

Attribute whose value describes the state of a given Design Object instance. In BDA, all instances of a given Object Type have the same parameter list. But the values of those parameters can change depending on the Prototype that was selected or the geometry defined by SGE for the Design Object instance.

People_latent_heat_gain

Total people latent heat gain given off to a space. Dimension: people_heat_gain.

People_sensible_heat_gain

Total people sensible heat gain given off to a space. Dimension: people_heat_gain.

Percentage_glazing_area

Percentage of the aperture surface area which is composed of glazing. The remaining percentage is assumed to be composed of the framing. Dimension: percentage.

Pilot_energy_consumption

Total energy consumption of the plant gas pilots (if any). Dimension: power.

Rated_fan_capacity

Total rated fan capacity, measured in terms of volumetric flow, produced by a HVAC distribution system's fans. Dimension: volumetric_flow.

Rated_fan_power

Total fan power necessary to operate the HVAC distribution system fans at full capacity. Dimension: power_efficiency.

Rated_pump_power

Total maximum pump power available from the plant. Dimension: power.

Rectangular

Whether a space is rectangular in shape or not; valid values are "yes" or "no." Dimension: none.

Relationship

A description of a single topological or functional connection between two Design Object Types, including the cardinality constraints and semantic behaviors implied.

RESEGY

energy use computational module that calculates monthly energy rrequirements by end use and energy source

Saturday_values

Hourly values for a typical Saturday. Dimension: percentage.

Schedule_type

Type of schedule (e.g., occupancy, lighting, availability, etc.). Dimension: none.

Schematic Graphic Editor

Mini-CAD application used to create and edit the geometry of your design in BDA.

SDB

Schema Database

SGE

Schematic Graphic Editor

Shading_coefficient

Ratio of solar heat gain through a fenestration product to solar gain through an unshaded 1/8” thick clear double strength glass under the same set of conditions without the effect of frames, mullions or sashes etc. Dimension: percentage.

Simulation Tool

A stand-alone application program used to calculate a subset of BDA performance parameters.

Solar_absorptance

Portion of the radiant solar energy striking the surface that is absorbed by the substance. Dimension: percentage.

Space Type

The functional use to which an area will be put -- examples of space types are bedroom, bathroom, kitchen, corridor, elevator, office, lobby, etc.

Spatial_glare_index

Glare index measured at a single time over a grid of reference points. Dimension: none.

Spatial_workplane_illuminance

Workplane illuminance measured at a single time over a grid of reference points. Dimension: illuminance.

Summer_maximum_drybulb_temp

Maximum drybulb temperature experienced by a site under summer design day conditions. Dimension: temperature.

Summer_maximum_wetbulb_temp

Maximum wetbulb temperature experienced by a site under summer design day conditions. Dimension: temperature.

Sunday_values

Hourly values for a typical Sunday. Dimension: percentage.

Surface_area

Area of a surface plane.

Temporal_glare_index

Glare index measured over time at a single reference point. Dimension: none.

Temporal_workplane_illuminance

Workplane illuminance measured over time at a single reference point. Dimension: illuminance.

Thermal_activity_type

Thermal_Activity prototype most likely for a given Space prototype. Dimension: none.

Thermal_conductance

Rate of heat flow through a unit area of a body induced by a unit temperature difference between the surfaces. Dimension: thermal_conductance.

Thermal_resistance

Mean temperature difference between two defined surfaces of a material or construction that induced unit heat flow through a unit area under steady conditions. Dimension: thermal_resistance.

Thickness

Smallest of the three linear measurements. Dimension: length.

Tilt

Angular distance from a vertical plane perpendicular to the window for fins and from a horizontal plane perpendicular to the window for overhangs. Dimension: plane_angle.

Time_zone

Time zone of the project site location. Dimension: none.

Total_energy_by_end_use

Total energy use of the building broken down by the end uses such as space cooling and heating, fans, lighting, equipment, hot water, miscellaneous and plant. Standby. Dimension: energy.

Total_energy_by_fuel_type

Total energy use of the building broken down by fuel type such as electricity, gas, coal, #2 oil, #6 oil, district heating, district cooling, other, and heating plant. Dimension: energy.

Total_energy_use

All the energy used by a building during the year including al fuel types and all end uses. Dimension: energy.

Type_of_glass

Type of glass used in a glazing assembly (i.e. transparent or translucent). Dimension: none.

Unit

Part of a value that describes its quantity (e.g. feet, miles, foot-candles, lux, BTUs, etc.).

Unit_configuration

Configuration of plant unit operation (acceptable values are “parallel” or “staged”). Dimension: none.

Unoccupied_infiltration_rate

Infiltration rate during “occupied” conditions. This infiltration rate generally refers to the rate when the HVAC system is “off.” Dimension: volumetric_flow.

Ventilation_rate_per_person

Average ventilation volumetric flow per occupant. Dimension: volumetric_flow.

Visible_reflectance

Ratio of visible light reflected by a surface to the light incident upon it. Dimension: percentage.

Visible_transmittance

Visual property which rates a materials’ relative translucence. Dimension: percentage.

Visual_activity_type

Visual_Activity prototype most likely for a given Space prototype. Dimension: none.

Volume

Length multiplied by width multiplied by height of a space expressed as cubic units. Dimension: volume.

Weekday_values

Hourly values for a typical weekday. Dimension: percentage.

Winter_minimum_drybulb_temp

Minimum drybulb temperature experienced by a site under winter design day conditions. Dimension: temperature.

Workplane_height

Height from the floor at which the DCM-ECM (Daylight) simulation calculates the spatial illuminance. Dimension: length.

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